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ABSTRACT

The document emphasis is directed toward the delineation of the various groups of exceptional children, their characteristics, and their problems. Ongoing industrial arts programs for gifted children, slow learners, mentally and physically handicapped, disadvantaged and culturally deprived, and dropouts are identified and comprise most of the document. Only materials written during the last decade are covered in the review. It is concluded that industrial arts literature contains very little for the physically handicapped, mentally superior, or emotionally disturbed student. To better serve the needs of special students, it is recommended that industrial arts educators: (1) reconceptualize the rationale for industrial arts study at all grade levels for those students; (2) restructure instructional objectives in behavioral terms; (3) develop and evaluate instructional units and systems, instructional technology, and instructional software and hardware; (4) modify teacher education; change the teacher's role; (5) expand efforts for therapeutic and remedial contributions for exceptional children; (6) use empirical research and evaluation techniques in materials development; and (7) provide inservice education. (A 15-page bibliography is included.) (AG)

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REVIEW AND SYNTHESIS OF RESEARCH ON INDUSTRIAL ARTS FOR STUDENTS WITH SPECIAL NEEDS

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A REVIEW AND SYNTHESIS OF RESEARCH ON INDUSTRIAL ARTS FOR STUDENTS WITH SPECIAL NEEDS

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1973

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FOREWORD

Industrial arts teachers have become increasingly concerned with problems relative to the education of exceptional children. Major emphasis in this publication is directed toward the delineation of the various groups of exceptional children, their characteristics, and their problems. The author identifies ongoing industrial arts programs for gifted children, slow learners, mentally and physically handicapped, disadvantaged and culturally deprived, and dropouts. Preoccupational and vocational benefits of industrial arts to the learner are emphasized in most programs. The author concludes by identifying ten areas needing additional research.

The profession is indebted to James J. Buffer for his scholarship in the preparation of this report. Recognition is also due Ralph Gallington, Florida State University; and Rutherford Lockette, University of Michigan; for their critical review of the manuscript prior to final revision and publication. Wesley E. Budke, Assistant Director for Information Utilization at The Center, coordinated the publications's development and Alice J. Brown provided the technical editing.

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INTRODUCTION

The main purpose of this publication is to provide a review of manuscripts that directly relate to industrial arts for exceptional children--learners with special needs and unique capabilities. The selection of publications was not limited to research or development activities, but includes a broad spectrum of articles, books, theses, and the like prepared by industrial arts educators to disseminate the results of their creative and scholarly activities. While it is recognized that a number of manuscripts with interesting and relevant contributions have appeared since the advent of manual training in the latter part of the 1800's, the decision was made to limit this review to materials written during the past decade.

A cursory review reveals that similar topics and themes continue to be identified and developed through the years. The problems and solutions related to the education of children with special needs and capabilities also appear to remain constant although technological developments have produced a more complex social environment, thus complicating the personal functioning of some children with learning disabilities. It is hoped that the preparation of this review and synthesis of information will serve as a stimulus and referent for industrial arts educators to develop more effective techniques, practices, and strategies to improve the efficiency of industrial arts curricula for students with unique needs and capabilities.

It is also recognized that many neophyte and experienced teachers, as well as industrial arts teacher educators, lack professional preparation relative to teaching children with special needs. The information reviewed in this publication should provide this audience with a composite picture of the unique educational characteristics, needs, and interests of exceptional pupils. It also contains a review and synthesis of the contributions of our professional colleagues regarding educational practices, techniques, and strategies which they have found to be of value in teaching students with unique learning needs.

Hopefully, this information will reduce the fear that many teachers experience when confronted with "different" children. Also, as informed educators, we should be in a better position to create a learning environment which will be of more value to all learners.

A second purpose for completing this document is to identify and review journal articles and research reports related to industrial arts and the education of students with special needs that are part of the Educational Resources Information Center (ERIC) in a single publication. Bibliographical information and retrieval data are provided for those who wish to obtain and review the original manuscript. The identification of these manuscripts was accomplished by selecting appropriate descriptors reported in Research in Education (RIE), Abstracts of Instructional Materials in Vocational and Technical Education (AIM), Abstracts of Research Materials in Vocational and Technical Education (ARM), and Current Index to Journals in Education (CIJE). The bibliography provided by ERIC was supplemented by a conventional method of searching the literature, mainly through a "manual" review of the Education Index, the Reader's Guide to Periodical Literature, and dissertation abstracts produced by the American Council on Industrial Arts Teacher Education (ACIATE) Research Committee.

It is recognized that some significant reports of research or other publications may have been inadvertently overlooked in this review. A few research reports and publications are omitted purposely because of repetitive themes that are adequately reviewed. Moreover, one could assume that reviews of valuable literature do not appear in this publication because of neglect in submitting to ERIC copies of unpublished manuscripts for inclusion in the retrieval system.

Particular recognition for assistance provided in the development of this publication must be directed to Wesley E. Budke, Assistant Director for Information Utilization, The Center for Vocational and Technical Education who identified the descriptors for retrieving information; and my wife, Loretta C. Buffer, Career Education Evaluation Consultant, The Center for Vocational and Technical Education, who assisted with the retrieval and review of information which helped make the publication possible. Finally, the writer expresses his appreciation to the many scholars in industrial arts education whose articles and manuscripts are reviewed in this publication and whose pursuits have contributed information to our accumulated body of knowledge of industrial arts and human performance.

INDUSTRIAL ARTS EDUCATION AND EXCEPTIONAL CHILDREN

According to the Ad Hoc Committee on Criteria and Guidelines for Funding Industrial Arts (1972: 26), "Industrial Arts...provides unique opportunities for students to participate in representative experiences in industrial processes and occupations." It assists in the discovery and development of personal aptitudes, interest, creative technical abilities, self-reliance, sound judgment, resourcefulness, adaptability, problem solving, and expression in an industry-related environment. Industrial arts can bring about wholesome changes in the learner since it affects his habits, attitudes, understanding, and his ability to function as a consumer, employer/employee, and citizen.

The above concepts were put forth by the committee composed jointly of American Industrial Arts Association (AIAA) and American Vocational Association (AVA) members as supportive evidence that federal funding for industrial arts should be included in the amended Vocational Education Act as a part of career education. Work-study programs abound; cooperative education ventures are touted by education, industry, and government, as panacea to societal ills (Buffer, 1972).

Unfortunately, an analysis of educational practices supports that industrial arts programs appear to be geared to the so-called "normal" or "average" educational population in the nation's schools. Too little attention is given to those with special needs, who do not resemble the easily-dealt-with youngster who is considered "normal." For example, of the proposed five phases of career-oriented learning in industrial arts as described by the report of the Ad Hoc Committee (1972), only one is apparently concerned with those who cannot benefit from the broad basic instruction afforded the general school populace; this is the fourth phase, Adult and Continuing Education. This phase would concern adults and out-of-school youth who may benefit from education related to industrial and technical occupations.

Lockette (1972) expresses the opinion that the Ad Hoc Committee believes that their policy statements are geared to all youth regardless of one's educational achievement, intellectual potential, socioeconomic status, race, sex, or religious affiliation. However, he suggests that one may take the position that the responsibility of directing attention to the problems of youth with special needs has been neglected to the extent that special mention of it should have been made.

A cursory review of the recent literary contributions in industrial arts education suggests that interest in the educational needs of students with learning problems continues to be prevalent. An increasing amount of professional activity has been concerned with the educationally disadvantaged learners in urban and rural centers. Admittedly, a wide segment of students now in school fall into the categories of disadvantaged or culturally deprived--candidates for dropping out. However, the scope of special needs students goes beyond those deprived by environment, poverty, or other social and economic forces. What of the mentally retarded, the slow learner, or the emotionally disturbed? How about the physically handicapped, the blind and deaf, and the student with orthopedic disabilities? And, at the other end of the educational continuum, there are superior or gifted students.

Children in each of the above groups have unique needs, interests, and capabilities which deviate greatly from those exhibited by "normal" learners; thus they have been labeled as "exceptional" students. In each case, the conventional school program must be adjusted to provide them with successful learning experiences and insure their improved achievement performance.

The industrial arts teacher is in a unique position to recognize and care for the needs and interests, not only of the slow or retarded learner, but of the advanced one who, because of his superiority, is too often ignored or thought of as being bright enough to care for himself. Inherent in the industrial arts are skills and activities which challenge minds, both slow and quick. Manual activity can be therapy for everyone at one time or another; mental gymnastics necessary to design a product and execute its manufacture can be geared according to mental and physical abilities. A relaxed atmosphere in a laboratory with low teacher-pupil ratio to allow for individual attention and facilities for expressiveness and creativity can do much to alleviate educational and personal problems brought about when a student is "different."

Of particular importance is the acceptance of the general theme that industrial arts personnel broaden their professional concerns for all students with unique educational needs as they have traditionally done for "average" learners. Hopefully, new federal and state legislation along with an upsurge in the development of innovative professional practices may serve to stimulate activity and progress in this desired direction.

Definition of Terms

Customarily, before beginning any discourse, writers present a description of terms used, their definitions, and reasons for using them. Since this review will be divided into discussions of various types of exceptional students, learner classifications and related terms will be defined as they are presented in each section.

As a general referent, the term "exceptional children" will refer to those students who by virtue of their unique needs, interests, and capabilities deviate greatly from those behaviors exhibited by "normal" learners. They may be mentally gifted or retarded, physically or psychologically handicapped, socially or economically deprived.

The term "industrial arts," however, presents a problem of a different nature. Semanticists in the field of industrial arts have argued, (and probably will continue to argue) the meanings included in the term, particularly as opposed to vocational education, occupational education, and trade and industrial education. It could, indeed, be a topic for another publication. For purposes of this review, Industrial Arts

> ...is an organization of subject matter which provides opportunities for experiences concerned with developing insights into the broad aspects of industry; such as construction, transportation, communication, manufacturing, and research and development with the resulting personnel and technological effects (American Industrial Arts Association, n.d.:1).

Industrial Arts provides learners with experiences and knowledge about the man-made world much like science does the natural world. An emphasis is placed on the study of technological practices used by men to work efficiently with men, materials, tools, and techniques to produce goods to satisfy their needs and desires.

The above description of industrial arts appears to be consistent with the discussion of industrial arts education and the goals for contemporary industrial arts programs prepared by a subcommittee of the American Vocational Association (1968) for the revised edition of A Guide to Improving Instruction in Industrial Arts. In general, it may be perceived as a relatively new curriculum area in formal school education, with most of its development occuring during the past 60 years.

Purpose of the Study

In the 1960 Encyclopedia of Educational Research, Hutchcroft offers an opinion which supports the major purpose for preparing this review and synthesis:

> Making provision for individual differences has long been a method employed by industrial arts teachers. Needed are research studies that identify specific practices which have appeared effective in teaching the gifted student and practices appropriate for teaching the slow learner (Hutchcroft, 1960: 693).

This challenge to industrial arts educators is congruent with the position of the American Industrial Arts Association (n.d.: 1) which states that Industrial Arts

> ...should be a part of the learning experiences of all students at all levels of grade and ability in order that they may understand and learn to control their industrial-technological environment.
>
> ...Uniquely contributes to students who must leave school early and those who continue their formal education; for students with low scholastic ability and those on the honor roll; for the future industrial workers and for the future professionals; for those of both high and low economic status. All members of society must learn to be aware of and to live effectively in today's technological culture.

In essence, Industrial Arts is concerned with industry and its personnel practices, production practices, and products. Its educational experiences should be of benefit to all persons, providing information and skills necessary to maintain and improve man's existence in a technological culture.

To determine what contributions industrial arts educators have made to the education of exceptional children for approximately the last 10 years, it was deemed necessary to scan the literature in the field from the time which the Readers Guide to Periodical Literature first began to publish, 1929, to see if the comparative upsurge of interest in "special education" in industrial arts has been the rule or the exception in the history of the field.

As far back as September, 1929, the Industrial Education Magazine included an article by Ludlow and Johnson, entitled "Giving the Underprivileged Boy a Chance; Earning Money for Camp Expenses." Unfortunately, the article could not be found to determine what the authors meant by "underprivileged." The next year, Industrial Arts and Vocational Education contained Abercrombie's (1930) opinion of "The Special Child in Our Scheme of General Education." Shortly after this, interest in meeting the needs of students who deviated from what was considered "normal" classroom behavior developed rapidly. In the early 1930's, for example, The Ohio State Committee on Coordination and Development (1934) undertook the writing of A Prospectus for Industrial Arts in Ohio, which includes advice on programs for the handicapped and the gifted, mentally retarded, behavior problems and, interestingly, students with "lower ability," i.e., cardiac cases, epileptics, and the like. About the same time, a committee appointed by the U. S. Commissioner of Education was instrumental in developing a federal bulletin published by the U. S. Office of Education (1935) entitled "Industrial Arts: Its Interpretation in the American School." The Committee's strong feelings that industrial arts has an important part to play in helping "special" children is evident in this publication.

In the 1940's, all attention seemed to focus on the war, industrial arts for girls, and the first concentration on individual teaching aids. The fifties brought a renewed interest in topics such as manual arts therapy; the handicapped, slow and maladjusted pupils; and one of the first mentions of the term so popular now, the "dropout." The sixties have introduced a tremendous increase in publications concerning industrial arts for students with special needs.

In an effort to synthesize each problem area as it is described in the literature, the area of special interest will be defined and described. Students who are generally classified or placed in the area will be identified, and their needs and interests discussed according to industrial arts personnel who have taken the time to study them. Learning levels, processes, and teaching methods and techniques which have been studied will be presented. Any reference to success with a particular method of instruction will be described; implications for further study or use of methods will be presented as it is reported in the literature.

A note of pessimism must be injected here. Industrial arts for special students can be compared to the weather--everybody talks about it....At least, this was the case in the early sixties when many authors presented over and over again similar information and recommendations. If these recommendations were carried out and findings applied to

instructional practice, there is little indication of it in later publications. Also, a need for replication of research studies and an evaluation of proposed educational technology is appallingly evident.

Perhaps this review of the subject will spur some on to (1) disseminating what successful instructional programs and materials they have experienced for students with special needs, (2) investigate these special needs on a more expanded basis including the replication of research studies, (3) incorporate and evaluate the efficacy of recommended educational practices, and (4) create and carry out new studies to determine the unique contributions of industrial arts for helping people with special needs.

REVIEW AND SYNTHESIS OF INFORMATION

Gifted Students

The area receiving the least attention in the literature concerning industrial arts for students with special needs is traditionally the area most neglected in other subject areas also. This is the upper echelon on the educational ranks, the gifted student. He is also known as the "more capable," the "superior," the "exceptional" (which is often used as a generic term for all learners with special needs), and the "mentally superior." As is the case with all the areas to be discussed, there is no one definition which encompasses all the traits and characteristics of what shall now be called "gifted." Rather, the abilities possessed by this group can be listed and identification of gifted students can be made from it. This special group sees and makes association and interrelation of concepts quite readily. They can create new ideas, reason through complex problems, and critically evaluate facts and arguments.

The temptation to use the IQ score alone, as measured by a standardized intelligence test, is great until one considers that a student with superior intellectual capabilities may be physically slow or lacking motor skills necessary to work in the laboratory. Sometimes this occurs temporarily only until physical maturation catches up with mental ability. However, a review of research on the education of the gifted suggests that it appears to be a general practice to classify students with an IQ of 120 and above as gifted.

Industrial arts is not the only area of education which has a problem in identifying the gifted. Innovative testing and educational programs can help, such as a combination of the traditional IQ measure and the creativity measure which may soon be available (Harney, 1970). For purposes of this review, the gifted are defined as those above-average students who learn quickly, "organize data efficiently, reason clearly, and show an interest in a wide range of abstract concepts. As a rule, they are above-average in their use of vocabulary and in reading skills" (Bish in Keeny, 1970: 453).

Here, a note of caution must be inserted. Not only with the gifted, but with students of all other level abilities, the industrial arts teacher should not and cannot be the sole judge of their unique capabilities nor should he try to make any diagnosis without professional assistance. Although in an excellent position to observe the ability levels of industrial arts students and to teach and counsel them, especially as a part of career education, the industrial arts instructor should consult with school counselors, cumulative records and other aids, as well as staff, to develop programs best designed to serve this segment of our educational community.

Horn (1966) shares the feelings of many other industrial arts educators when he bemoans the fact that more capable students are not guided toward the industrial arts curriculum. Such students need to be viewed as possible future industrial arts teachers. Horn discusses and describes two academic programs used in "academic" subjects and recommends applying these approaches in industrial arts. One program suggests that college level courses be offered to capable high school students, perhaps during the summer, to introduce gifted students to industrial arts. The other would make the area an attractive and challenging experience to students with superior ability who have the potential to fill the gaps left by the attrition of able industrial arts teachers to industry and other factors which account for the current shortage of qualified teachers.

Silvius and Bohn (1961) recommend that the needs of gifted learners should be considered by industrial arts educators when developing curriculum plans so that industrial arts can help prepare aspirants to engineering, science, and education. They suggest that educators' goals can be accomplished by assisting gifted students in learning how abstract concepts are applied to industrial problems, processes, products, tools and machines.

Knoll (1960) felt the need to modify his basic instructional program for a group of gifted secondary school students enrolled in ninth grade metalworking. He sought the assistance of other experienced

industrial arts teachers to determine what methods and strategies were successful in satisfying the intellectual capacities and interests of mentally superior pupils. Although some teachers felt that their basic program was satisfactory for pupils of all ability groups, a greater expectation for quantity and quality of project construction, design, planning, and outside homework and preparation was evident. However, other teachers did not agree that children of superior intelligence exhibited greater digital and manual dexterity although they also saw value in the completion of research reports and other assignments that required outside preparation.

Based on his informal study, Knoll suggests that the needs and interests of gifted students could best be served in a special class which includes instructional activities designed to challenge the students' intelligence, aptitudes, and interests. To achieve this goal, he conferred with the school librarians to determine what category of reading most appealed to the boys. The area of science was identified and students were given an opportunity for personal investigation and cooperative group study to research several fields of physical science. One example, "A Unit of Study into the History of Power," required the preparation and presentation of a research report and the manufacture of working models of such products as a solar furnace, water wheel, and a steam gun carriage designed orginally for Napoleon. The design and construction of all projects were required to reflect the proper use and understanding of tools, materials, and machines. In addition to developing technical skills and learning information about our industrial civilization, avocational interests and consumer information skills were developed.

Research in the industrial arts laboratory is further discussed in the proceedings of the 32nd annual American Industrial Arts Association (AIAA) convention in 1970. Keeny (1970) defines the gifted, states their abilities, and describes his teaching program which focuses on research activities in the laboratory designed to increase student motivation. He recommends that industrial arts teachers read Toffler's Future Shock (1970) regarding our rapidly changing technology. He feels that this information will help them understand why man must adapt to technological change and to understand the role of industrial education as a part of this adaptation process. Keeny also illustrates a "formula" for course accomplishment which he has used at the junior high school level.

Industrial arts is a natural place for some gifted students to make preoccupational and career choices. In addition to selecting teaching as one's vocation, many talented pupils may eventually pursue adult careers in some area of industry. Opportunities in manufacturing,

for example, would include employment as engineers, designers, psychologists, administrators, researchers, attorneys, and other management roles. To help industrial arts teachers provide educational guidance to gifted pupils, Harney (1970) defines the characteristics of an ideal relationship between the gifted student and the industrial arts teacher who also functions as a counselor. He proposes that teachers design curriculum to utilize problem-solving, research, and experimental activities with wide individual latitudes to enable gifted students to profit most from their educational endeavors.

Maley (1967) decries the dearth of literature in industrial arts devoted to the gifted, and gives suggestions to the profession to make up for this inadequacy. He recommends first identifying the gifted as those individuals who are not only intellectually gifted but who also show promise in all aspects of education. He gives Paul Witty's interpretation of the gifted as those whose performances are consistently or repeatedly remarkable. The school and the industrial arts teacher must identify and deal with these distinctive characteristics: a high IQ (120+), high functional ability coupled with general intellectual ability, high order talent in a special area, curiosity, independent thinking and judgement, courage of convictions, absorption and pre-occupation with tasks, intuition and perception, and unwillingness to accept things on mere say-so.

Since the industrial arts profession has not done much research in teaching the gifted, other areas of education which have done so should be examined, e.g., science and music, to determine what type of instruction and opportunities could be appropriate to this group. In this regard, industrial arts must offer a higher degree of challenge and a greater scope and variety of experiences than it does for average students. Maley (1967) provides a synthesis of the published contributions of several education scholars on the subject of the gifted--Torrance, Dale, Flieghers, and Gold, to name but a few.

The chairman of the industrial arts department of a Fullerton, California high school reports on an industrial arts course specifically designed for above-average high school seniors (Storm, 1961). The course is based on the premise that technical-manipulative experiences can provide the opportunity for an application of mathematics, science, and other subjects as well as give a basis for better understanding of the theoretical phases of industrial education.

Storm's (1961) survey of several engineering colleges, including Stanford, indicates that the course would be acceptable as an academic requirement under the title of "Preengineering Industrial Arts."

Students are selected for the class based on their outstanding performance, reports, and demonstrations. Detailed instruction sheets are used along with a variety of equipment and materials, especially woods and plastics utilizing power equipment. Storm feels that those teaching this type of course need extensive study in metallurgy, engineering materials, and manufacturing techniques in order to make the course effective and accurately portray industrial practices. The course should offer the bright student an orientation to technical, engineering, or scientific study, since the students enrolled are also taking physics. Although they are provided conventional experiences with hand tools and machine tools as well as instruction in industrial methods and processes, students also incorporate the development of class-built projects into hypothetical commercial enterprises. Many student projects are of a science-demonstration nature, thus reflecting their interest and achievement in science. Student interest apparently is high and discipline problems are reported to be nonexistent.

Gearan (1969) advises the industrial arts teacher to look for methods of getting the college bound student into mechanical drawing classes. Two suggested methods are: (1) using descriptive geometry as an approach to projection theory for more capable students, and (2) using nomography and various types of logarithmic scales and charts in the analysis of experimental data. Both techniques require integrating the drawing program with other subject areas in which gifted students commonly enroll. The teacher should relate the knowledge that he has to the realities of current educational thought and modern industrial technology so that gifted students will see a relevancy in industrial arts to their personal needs and aspirations.

Multi-level teaching techniques and class organizations are still another means of permitting gifted students in industrial arts to develop at their own pace. The curriculum at Lexington (Massachusetts) High School includes three different programs for gifted students. The three choices are: (1) pre-engineering courses such as pre-engineering laboratory experiences or engineering graphics and graphic science; (2) research and independent study programs wherein each student uses community resources to study a problem approved by his advisor and the department head; and (3) "Education Without Walls" offered to seniors studying a broad topic or system, such as "man and his environment," wherein short-term or mini-courses in the industrial arts department are offered on an interdisciplinary basis (Gittzus, 1969).

The latest entry in the professional literature at this writing regarding the gifted is a brief article in Monitor, the quarterly publication of the AIAA (1971). Pennsylvania has established guidelines

and leadership for an enriched program for gifted students wherein industrial arts enjoys the same recognition and attention given to academic subjects such as linguistics, science and music. Consultants from education and industry are brought into the school to work with the gifted in many technical areas because the state department of education believes that "The children of today who will be the engineers and architects of tomorrow must have the opportunity to think and create with three-dimensional materials" (AIAA, 1971:15).

The gifted student is often neglected in the conventional school program. It is often assumed (and mistakenly so) that the bright, capable person will benefit from the regular instruction and go on to further his own development.

The industrial arts curriculum for gifted children must be modified to best serve their unique needs, interests, and capabilities. While it is recognized that manipulative activities should also be an appropriate part of instruction for the gifted, an emphasis must be placed on activities which encourage creative and problem solving skills. Industrial arts instruction should be made interesting and exciting to this group of children by supplementing their educational program with responsibility for student-directed small group instruction and managerial-type experiences. Hopefully these types of activities will provide them with meaningful opportunities for leadership development and also stimulate their interest in becoming industrial arts teachers.

In reviewing the literature, it is also necessary to point out what is not included or presented. In addition to the dearth of material on industrial arts for the gifted in the last decade, one must take a hard look at presentations which ignore or skirt the topic. One significant example of this omission is found in an issue of Man/Society/Technology which mainly concerns education of the special needs student. This official AIAA journal includes articles on the "educationally handicapped," "culturally deprived," and "mentally retarded." As is too often the case, the gifted child is not specifically mentioned as part of the concern. However, the introductory editorial emphasizes that "...industrial arts stands out as a natural functional aspect of each child's education.....This is where dreams merge into expectations and then into achievement" (Kabakjian, 1971: 72). Still, the underprivileged and slow learner come to mind because of statements in the editorial that students may require physical or mental therapy before ordinary curricular content is introduced.

It must be recognized that gifted learners also have special needs often not satisfied by the conventional school curriculum. The neglect to modify industrial arts programs for talented students will only

result in the failure to nurture the wealth of potential human resources necessary to maintain and improve society.

Recognizing the need for additional concern on the part of industrial arts educators for gifted learners, we proceed, then, to look at what is being done for students at the lower end of the pedagogical continuum, the slow learners.

Slow Learners

This special stratum of educational society does not include educable or trainable mentally retarded, who will be discussed later. For discussion purposes, the slow learner is identified as one having an IQ within the approximate range of 80 to 95 accompanied by less than average ability achievement, and retarded motor skills (Cruickshank and Johnson, 1967:4, 195). Often because of his frustrations in not performing well in school subjects, the slow learner may react by leaving school earlier or exhibiting unacceptable behavior.

As far back as the 1920's, the advantages of industrial arts for slow learners were heralded. Too often, however, slow learners were equated with mental retardates and the terms were used interchangeably. An example is Wust's (1944) "Industrial Arts for the Slow Adolescent" wherein it states that the industrial arts teacher can help the mentally retarded boy with general education by giving simple reading, mathematics and writing tasks. Teaching by ordinary methods simply by slowing down the tempo or simplifying regular projects, as well as decreasing lecture time and increasing physical activity are recommended. Wust also reports that "mentally retarded" boys often come from poor homes; therefore, they should learn to perform simple household repairs, and construct a variety of wood projects to improve their homes since "wood is cheap."

Current teaching practices reported in the literature seem to reflect some of the thinking described above and refute some of it. Many industrial arts teachers complain that their area is a "dumping grounds" specifically for slow learners. Some teachers feel that this is a challenge, while others regard it as a burden (Woodward, 1967). This might be supported by a U. S. Office of Education study which indicates that the greatest percentage of students enrolled in industrial arts are of low ability (Feirer, 1963). Average ability students apparently take about the same amount of industrial arts courses, while higher ability students take fewer courses in this field. This report has been considered to be significant in planning the scope and depth of future programs in industrial arts.

The information reported by Feirer (1963) was collected as part of a comprehensive study by Schmitt and Pelley (1966) of the status of industrial arts in the United States. Their survey of programs, teachers, students, and curricula in industrial arts reveals 10 percent of industrial arts students to be above average in ability. Fifty-eight percent are average and thirty-two percent, below average. Providing for the slow learner ranks fifth out of seven problems reported by industrial arts teachers. The authors of the report say that new instructional materials need to be developed to solve all seven of the problems reported; they recommend increased effort on curriculum innovation and research.

Other studies seem to support the fact that many industrial arts students are of below average ability. Master's theses conducted by Adams (1966), Caley (1964), Pohlhammer (1966), and Wasilewski (1966) found that male students enrolled in senior high school (grades 9-12) industrial arts tend to be of lesser scholastic aptitude and ability levels than those male students who did not elect (or were counselled out of) industrial arts courses beyond those required at the junior high school level.

It is interesting to note that although the study by Wasilewski is a partial replication of one completed by Buffer in 1958 (Wasilewski, 1966), the findings are markedly different. Both studies were conducted in the same secondary school but with student populations that began senior high school before and after the Sputnik I era. It appears that the increased emphasis on guidance counselors channeling talented students into science related areas after Sputnik I resulted in a poorer or lower level ability group being "counseled" into industrial arts courses. This practice apparently did not exist in 1953 when the first group began senior high school. Also, the number of full time guidance personnel at that time was minimal compared to present organization.

Some indication of the concern prevalent in the industrial arts profession is reflected in the activities of the Slow and Reluctant Learners Committee of the Industrial Arts Division of the American Vocational Association (AVA). This committee identifies slow and reluctant learners as: (1) academically retarded, especially in reading, with achievement age lagging behind their chronological age; (2) appreciating knowledge for its practical, vocational ends, but rarely for its own sake; (3) needing to see concrete application of what is learned to immediate sensory and topical satisfaction; (4) having hand skills as the sphere of their greatest likely success; and (5) failing to achieve as many and as varied adjustments as normal learners (Ralstrom, 1969b). Results of this committee's accomplishments have been reported in the American Vocational Journal and in recent editions of the national convention proceedings of the AVA, a few of which are reviewed in this publication.

Textbooks dealing specifically with industrial arts instruction for slow learners (or any special needs students, for that matter) simply do not exist. Silvius and Bohn (1961) do include several brief allusions to slow learners and the mentally retarded. Their contention is that, often, slow learners have been sufficiently rehabilitated by industrial arts courses to be able to go back to "regular" classes. No differentiation is made or definition given for mentally retarded and slow learners. While Silvius and Bohn's "opinion" has been expressed by many industrial arts educators, to document such a position with empirical evidence or finite data seems next to impossible. The Illinois Curriculum Guide of 1958 is quoted extensively by Silvius and Bohn with regard to how special education students can benefit from industrial arts and what is done in industrial arts that can help them, particularly in "activity-type programs."

A guide for teaching industrial arts to slow learners has been developed through a workshop of high school industrial arts teachers and educational administrators in Maine (Barron, et al, 1966). The material is recommended for small classes of boys with IQ's ranging from 75 to 90. The guide includes professional information and teaching suggestions for industrial arts teachers, a statement of objectives, and topical outlines for teaching the following occupational skills in grades seven through 12: (1) Production of Home Accessories (grade 7); (2) Building Repairs and Maintenance, and Small Gas Engine Servicing (grade 9, two units); (3) Industrial Machining Techniques (grade 10); (4) Building Trades (grade 11); and (5) Automotive Service Station Attendant (grade 12). These outlines are mimeographed and include a description of each occupation, including tasks and jobs to be performed, plus related information essential to developing these technical skills. Suggestions are provided so that the subject matter can be used selectively to meet the unique needs of the group and the individual students.

The belief that the techniques, projects, and equipment of industrial arts contribute substantially to a positive and dynamic program for slow learners has prompted the development of an industrial arts program specifically for these students, including specialized facilities and instructional techniques (Reppe and Wrobel, 1960). In addition to getting slow learners "out of the way of 'real' education," the program is designed to provide opportunities for students to express themselves, as well as to teach them to be self-sufficient citizens. The following activities are suggested as being practical, safe, and useful: leathercraft, marbling, woodburning, stick printing, bookbinding, basket weaving, graphic arts, plaster of paris casting, clay modeling, and soap carving. Instruction in proper handling of tools and materials is facilitated through films, displays, and other audio-visual aids, supplemented by teacher demons-

tration. A suggested beneficial by-product of using such aids is that the slow learners in time can be taught to make their own audio-visual aids and use them.

Industrial arts can be proud of the service it performs in the education and adjustment of students who cannot keep up with the pace of general education. According to Runnalls (1960), shop organization and management involving the slow learner teaches responsibility and, in cases where maturity permits, authority. Remedial students who can be motivated to learn in industrial arts can also be taught to read, if activities are planned to encourage them to read in order to execute a project. Written assignments should be kept to a minimum, but mathematics appears to be a natural subject area to be taught in the shop especially in terms of measurement and cost determinant exercises. Teaching shop safety may be difficult since, in normal classes, satisfactory scores on written tests are often required of students to allow use of power equipment. Slow learners enrolled in Runnalls' program were taking industrial arts classes primarily to learn proper use of power equipment, so safety practices had to be taught first. Brief demonstrations rather than lectures were used, with the opportunity for intensive repetition both of the demonstration and student practice.

Heyman and Holland (1966) recommend reading as a significant part of industrial arts laboratory activities with reading improvement as the main goal. The industrial arts teacher should keep the instructional program up-to-date, particularly with literature from industry which will serve the dual purpose of getting pupils to read as well as providing them with information about the world of work. They suggest close cooperation with the remedial reading teacher. Woodworking is considered a good laboratory activity to stimulate an interest in reading; pupils can make mobile bookcases or similar projects as a means of getting them involved in reading programs as well as helping the reading teacher. Another project, an electric phonic exercise board, could be easily constructed by wood and electricity classes and used by the remedial reading teacher to teach spelling and different phonic elements. Heyman and Holland give principles to follow for such a cooperative program as well as other suggested techniques for reading improvement.

The challenge to industrial arts education involving slow learners is described by Nelson (1964). He specifies his own definition of slow learners and excludes the non-educable mental retardate and the emotionally disturbed as likely industrial arts students. Nelson emphasizes a focus on the service occupations involving mass production projects, as well as skillful use of basic hand tools, all the while including fundamental academic subjects. His slow-normal students are differentiated from the mental retardates and characteristics of each are identified.

Also directed to slow learners at the junior high level, specifically the ninth grade, Glismann (1967) has developed special programs in arts and crafts, hoping to motivate slow learners with past records of low achievement to change their attitude toward learning. He reports that special treatment has not brought about statistically significant changes, either in attitudes, self-perception, school attendance, or citizenship. Mathematical achievement is the only area in which the students in the experimental program have improved significantly.

Bonar (1968) provides a brief review of the literature related to the characteristics and education of slow learners and offers industrial arts teachers 12 recommendations for instructional techniques, e.g., simplifying activities and capitalizing on individual abilities. His discussion suggests that the industrial arts laboratory is the ideal learning environment for using the recommended techniques for special needs students.

Mentally Handicapped

Mentally handicapped students may be described as those with learning disabilities. On the other hand, this description could also encompass the slow learners or children with physical or social handicaps. Granted, the mentally retarded are slow. They do not learn cognitive information, develop attitudes and values, or develop psychomotor skills at the same rate as "normal" learners (Cruickshank and Johnson, 1967). However, they must be classified using multiple criteria such as measured intelligence (IQ), adaptive behavior, and physical maturation.

Approximately one in five children in the United States is a slow learner (about eight million) with an IQ falling somewhere in the range of 80 to 95. Three percent of the total population (about four and one-half million) are listed as mildly or educable mentally retarded (EMR) and have an IQ within the range of 50 to 70 (Szurek and Berlin, 1968). Most retarded children enrolled in the public schools are EMR, although a smaller percentage are moderately trainable mentally retarded (TMR), with an IQ or 30 to 50 and marked retarded adaptive behavior.

With increasing technological developments and resultant new products and services available to consumers, it is apparent that social functioning is becoming more complex in our environment. As a result, increased intellectual capabilities and development are needed to adequately function as a citizen and to remain self sufficient and productive. Therefore, the writer suggests that the borderline for mental retardation may well be changed to only one standard deviation below its means--IQ of approximately 85.

The definitions of "retarded children" and the IQ range used to clarsify these children vary slightly, depending upon an author's viewpoint or upon legislation of a particular state. For purposes of this synthesis, and at the risk of overlapping the previous section, the educable mentally retarded student may be one whose IQ is between 50 and 85; he comprises the greater portion of students with educational and social deficiencies who are enrolled in public schools (Buffer, 1969a).

Some of the distinguishing characteristics of the EMR student are a low IQ and reading ability, low mathematics skill, and slow motor development. These students are not acutely aware of environmental conditions, they form restrictive psychological sets (habits), and have difficulty when processing a sequence of visual stimuli. They have a short attention span, poor interpersonal skills, impaired achievement at the sensory input level, and retarded interest and motivation in school and learning (Buffer, 1971a).

The Schmitt and Pelley (1966) national survey of the status of industrial arts reports that most of the students enrolled in industrial arts courses are from the lower 75 percent ability levels. There appears to be some consensus among educators, based on this review of information, that industrial arts can be quite beneficial to the retarded child. It can provide him with an understanding of industry, exploratory experiences of diverse activities, and therapeutic exercises (Buffer, 1971a).

The type of industrial arts program provided for the retarded learners and instructional techniques incorporated by the teacher greatly influence the behavioral changes exhibited by the learner. Buffer (1971a) provides recommendations of course offerings, grouping practices, and instructional techniques appropriate for industrial arts programs for educable mentally retarded learners. Industrial arts teachers can expand their professional efforts to provide more exciting and relevant educational experiences for children with learning disabilities. Industrial arts supervisors can support this effort by offering in-service training, determining community needs and working to fulfill them. The author also recommends that industrial arts teacher educators assume the responsibilty for modifying teacher preparation to include the study of techniques and practices for teaching retarded students.

The Ohio State Department of Education and the Ohio Industrial Arts Association thought the value of industrial arts for the retarded to be great enough to provide the leadership and professional assistance in researching the topic (Gates, 1971). Gates reports on the activities of a committee of experienced teachers and a college educator with experience in teaching industrial arts to retarded children who teamed up to write A Guide for Industrial Arts Teachers of the Educable Mentally

Retarded (Buffer, in press). The publication includes a discussion of the role and value of industrial arts for retarded learners, their educational and social characteristics, and suggested instructional units in construction and manufacturing practices; service and maintenance practices for houses, power lawn mowers, household appliances and furniture, and automobiles; and graphic reproduction practices.

Birkland and Cochran (1968) tell what characteristics the teacher of the EMR must possess, and provide guidelines for the training of these students to be self-controlled, self-supporting citizens. Their information was derived from a National Defense Education Act (NDEA) Institute at West Virginia University which had as its main topic for discussion the teaching of industrial arts to the mentally handicapped. The participants concluded that industrial arts can contribute greatly toward achieving personal, emotional, social, and economic independence for mentally retarded students, and must develop the innate potential of these students. The goals and objectives of industrial arts can be similar to those for normal children with minor differences in degree and emphasis.

Pooled experiences, such as those resulting from the NDEA Institute, are reported here to show that industrial arts has been effective in special education programs, so effective that one discussion centers around the proposal of a possible new professional organization entitled "American Industrial Arts Teachers for the Handicapped." Although many teachers would prefer working with more children, there are those industrial arts teachers who conscientiously attend to low ability students. These teachers may provide the only meaningful exposure to pre-occupational education and vocational guidance that the educationally retarded student will have. However, while many educators may agree that industrial arts programs can be viewed as a "stepping stone for the stranded," McFadden (1969) cautions that industrial arts should not exist solely for the benefit of those students that other subject area teachers will not accept the responsibility for or cannot handle.

Gill (1970) classifies mental retardates' needs for special education, and relates how vocational evaluation techniques can be used in the industrial arts laboratory to test the untestable person and how it can help identify the training and employment potential of the client. An example of how such evaluation may be performed is by incorporating a scale developed by the Arizona Division of Vocational Rehabilitation which is described in Gill's presentation.

Evaluation techniques for the EMR industrial arts student need not necessarily be different from those used for "normal" students.

An evaluation form was especially designed for educating and rehabilitating mentally (and physically) handicapped learners which could be also used in a regular industrial arts program (Lough, 1968).

The first part of the form developed by Lough obtains general personal information, history of past achievement and treatment, and immediate goals. The second part indicates teacher judgments and ratings of student independence and could be included in the learner's cumulative record to help other teachers of the handicapped. The second part also identifies industrial arts instruction including woodwork, metal, electricity, and other subjects taught. It presents a rating scale in the use of tools and equipment, areas of concentration, and other aspects of the child's educational process. This is a well-developed form designed by an industrial arts supervisor at the University of Iowa Hospital.

The fact that many "slow" learners are enrolled in industrial arts courses should have given the industrial arts teacher some experiences in dealing with learning problems such as the prominence of perceptual-motor difficulties, the need for encouragement and enrichment, and the value of an active learning environment.

Buffer (1969a) reports the contributions of Cratty, who synthesized studies which indicate that retardates with perceptual motor problems can be helped by: (1) tasks to improve visual-manual skills, (2) simple muscular tension to improve mental skills (verbal cognitive skills), (3) learning games to improve languages skills, (4) games which assure success to reinforce classroom efforts, (5) motor tasks requiring longer attention periods, (6) gross movements to improve spelling and numerical abilities, and (7) activities to improve pattern-shape recognition. Not only can industrial arts foster cultural literacy and occupational skills, but it also has the potential to provide therapeutic activities to foster other skills. Successful and enjoyable learning experiences in industrial arts can help modify the failure syndrome of retarded students, thus improving their motivation and willingness to achieve.

A six week instructional unit for eighth grade educable mentally retarded boys was developed to achieve the above-mentioned goals (Buffer and Pfeifer, 1970). The unit involved 12 days of laboratory instruction designed to modify negative characteristics of the retarded students, to assist in their education and social development, and to contribute to their development as productive and useful citizens.

Industrial practices were replicated--as closely as was possible in a school laboratory--to provide some experiences as industrial workers. Familiar toys which replicate industrial tools and were capable of

performing manufacturing processes with plastic stock were used as machinery. Some highlights of the unit were the manufacture of plastic products, a field trip to a plastics plant and paint factory, and role playing. The plastic products were presented to teachers and parents, thus promoting understanding and encouragement from these adults. Simulation of industrial management and personnel practices, and manufacturing production techniques helped keep reasonable order in the classroom.

The benefits of such individualized instruction for EMR students is supported by Drennan's (1969) study of employer evaluations of retardates enrolled in a cooperative work-study program. EMR employees are considered to be good citizens. In jobs where cautiousness and safety are necessary, their industrial education background is beneficial. The same holds true for EMR students whose jobs require them to work with other people. Student workers are generally rated high by their employers the first semester they are enrolled. Interestingly, higher employer ratings are also given to students from larger school systems, whereas those from medium and small school systems tend to receive lower ratings. A fringe benefit for EMR students enrolled in industrial education classes is that they generally have better experiences in other subject areas and classes.

Sharkey and Porter (1964) suggest that industrial arts programs planned for slow learners can be used for EMR students but most vary according to class size, population, teacher, and several other factors. They give the characteristics of mentally retarded students as well as characteristics of a good educational program for them. Such a program should educate the retardate for society, home, and family; and help him develop independence, by learning hygiene, basic tool subjects, how to earn a living, good use of leisure time, and ways to get acquainted with the community. The implications of a program for mental retardates includes personal, emotional, social, and economic adjustments.

Bortscheller (1967) and Fancher (1967) review the professional literature in education and psychology and synthesize the educational characteristics of the educable mentally retarded. Bortscheller then attempts to assess the feasibility of EMR students' success in drafting, and Fancher, the furniture manufacturing industries.

To accomplish these tasks, Fancher interviewed personnel in several furniture manufacturing companies in the Chicago region and found them receptive to employing EMR adolescents who have had successful industrial arts instruction at the secondary school level. Bortscheller's data regarding the feasibility of EMR males obtaining and holding a drafting job are based on an analysis of the educational and occupational

requirements of the draftsman and interviews with personnel in the drafting industry. It is apparent that retarded students with industrial arts experiences have a better opportunity for employment in occupations related to woodworking than those requiring more abstract performance skills such as drafting.

Job adjustment problems of the retarded are many and varied, but industrial arts classes can provide satisfying media for self expression and success (Sharkey, 1969). Sharkey names the identifying characteristics of the mentally retarded and representative characteristics of general education programs for them, and suggests characteristics of industrial arts programs for the retarded. Finally, Sharkey presents characteristics of the teacher of the EMR, these being genuine interest, sympathy, patience, sincerity, open-mindedness, and enthusiasm.

A high school experimental program for mentally handicapped has been established at Cox High School (Virginia) to determine the feasibility of a "regular" course offering, and to assess the influence of drafting on the learning of basic skills and improving motor coordination (Wilde and Silverman, 1967). The authors also hoped to introduce a new avenue to problem-solving. The success of the program depended largely on the opportunities provided for students to show pride in themselves and their work. The experiment reveals that EMR could do work comparable to that done by "normal" students, possibly opening a new life support area for EMR. Objectives and course content, suggestions for teacher preparation, and descriptions of equipment and facilities are presented, in addition to illustrations of assigned projects and drawings, necessary to teach the recommended drafting course for the retarded.

The University of Iowa Hospital's Pine School Division is a day school for mentally handicapped where industrial arts is used for five to 15 year-old EMR students to achieve the following goals:

1) Familiarize students with tools, hobbies, and vocational choices;

2) Develop an appreciation of good workmanship, materials costs, quality, and procedures;

3) Direct reinforcement of different therapies and classroom activities; and

4) Develop a sense of responsibility (Lough, 1969).

Lough believes that industrial arts should assume a major role in the programming of education for EMR (and physically handicapped) students:

> When industrial arts is developed to its fullest potential, it directly reinforces the educational and various other aspects of the individual's total program. Classroom activities and allied therapy become more meaningful to the children when the two areas work in conjunction (1969:227).

This suggests that the industrial arts teacher seek cooperative arrangement with other professionals in the school system to provide more effective treatment modalities for retarded youth.

Not all studies support the above-mentioned conclusions regarding the beneficial influence of industrial arts on the retarded. Jageman (1968) reports on a 10-week experimental period designed to evaluate the effects of industrial arts experience on intermediate and prevocational level EMR youngsters. Tests used were the California Test of Personality, Purdue Perceptual-Motor Survey, the Wide Range Achievement Test, and the Work Habits and Attitudes Rating Scale. The findings were that there was no significant relationship between group membership and any of the criterion measures. No statistically significant growth was noted on the criterion measures of personal and social adjustment, perceptual-motor development, academic achievement, and work habits and attitudes. Jageman concludes that industrial arts experiences during the 10-week treatment period have not effected significant differential gains on these criteria.

Wentz (1969) compares methods used by industrial arts teachers of EMR with those of special education teachers who teach some industrial arts as part of their professional responsibility. The study also (1) compares the experience and training backgrounds of the teacher, (2) determines tools and equipment currently used in these programs, and (3) develops a guide of industrial arts activities for teachers in these programs.

Fewer industrial arts teachers than special education teachers have some type of training related to the teaching of industrial arts to the mentally retarded. The teachers do not differ according to their highest degree earned and they agree that activities itemized in the study (crafts, metalworking, etc.) should be included in programs for EMR students at the junior high school level. A statistical analysis of the data discloses no significant difference between the opinions of the two types of teachers with regard to instructional activities, tools and equipment, and discussion topics employed in their programs.

Very often, schools which do not offer special programs for the retarded enroll these students in industrial arts and/or industrial education. Limiting them to these courses without benefit of other academic subjects results in failure to meet the academic and vocational needs of the EMR student, and failure to consider the intellectual demands of many skilled trades. Relegating the education of these students to industrial arts (and home economics) teachers who are not trained in the education of the EMR would be a mistake (Tisdall, 1964). Expecting a retarded youngster to read blueprints or operate intricate machinery is unrealistic; rather, he needs instruction in the basic academic subjects and basic industrial tools. Tisdall recommends that, rather than placing a retarded student into a shop program in an attempt to satisfy his educational needs, a school should first institute a special class with an experienced teacher of the EMR. Only when such a special education program is in effect should an administration try to establish a cooperative plan with industrial arts teachers becoming involved.

Kanicki (1969) describes a woodworking class especially designed for the EMR which provides for improved achievement performance when compared to the student's former classes which involved heterogeneous grouping. He states numerous objectives of the program, gives concrete recommendations for instructional methods, and identifies personality traits of the teacher.

Olson (1969) studied EMR students, aged 11 to 15 years, to determine whether they could perform certain woodworking skills with a measurable degree of proficiency following instruction and training in the use of eight selected hand tools. The findings indicate that the tools should be carefully selected to insure meaningful performance, adequate facilities should be provided, and demonstrations and lectures should be limited to five and seven minutes because of this group's brief attention span. Recommendations are made that industrial arts should be included as a regular subject for children with specific learning handicaps, and that related information in other subject areas should be introduced to stimulate and reinforce learning.

Smith (1964) discusses two instructional methods appropriate for working with bright and slow learners. He presents unique characteristics which the teacher has to recognize and deal with, and identifies intellectual differences of each group's characteristics. The first method reviewed is sociodrama and its application in the industrial arts laboratory. The other instructional technique recommended is individual and small group research. Smith provides a discussion of both techniques with recommendations for utilizing them for retarded and superior students in industrial arts laboratories.

Viggiani (1965) includes students who are mentally retarded, emotionally disturbed, blind, or hospitalized in his definition of exceptional children in need of some form of industrial arts. Five suggested areas of industrial arts for retarded students are wood, metal, home mechanics, auto mechanics, and general shop. Aspects of these programs which are also common to industrial arts for "normal" students are: use of materials, care of tools, operation of simple machines, elementary planning and construction, safety, finishing, and refinishing. Field trips, visual materials, basic related readings, and classroom discussions also are important.

Although the retarded child is academically below his chronological age, he can possess normal wants and desires for achievement, and industrial arts education can provide this. Viggiani describes a work-training program designed for the EMR (IQ 50-75) where students attend class for one half day and work on a job for the remainder of the day. The sheltered workshop, where work-training experiences are provided under constant supervision, may be part of the industrial arts program to help the EMR and TMR (25-50 IQ).

Wilson (1970) believes that industrial arts is an important part of the total school curriculum and should be made available to all students but particularly the EMR, mainly because industrial arts can provide the success which these students seldom achieve in other subject areas. Also, industrial arts provides rewards, teaches respect for the rights of others, and encourages group work. Wilson describes the EMR as academically below grade level, able to learn only materials organized at his ability level, lacking reasoning power, having a short attention span and poor short-term memory, as well as social and emotional immaturity.

Some guidelines to be utilized in the development of instructional materials and methods suggested by Wilson (1970) are:

1) Use only meaningful activities for teaching techniques.

2) Use projects that provide children with their own personal method of expression rather than a complex end product.

3) Give students a voice in the project selection.

4) Select activities that improve motor ability.

5) Compliment each student on his finished product.

6) Organize to provide social interaction within a group for exchange of ideas.

7) Do not do the job for the student.

Ferrerio (1960) believes that industrial arts motivates pupils to read. It offers opportunity for success, meaningful context for reading, a self-learning situation, informal atmosphere and first-hand experiences. He describes methods of reading techniques used in a junior high school program for teaching reading in the industrial arts laboratory to reluctant learners and retardates, and gives specific recommendations for instructional techniques and practices.

Moeller (1963) does not believe that industrial arts is specifically designed for the slow learner, but that it functions for the exceptional child whether he is gifted or slow. He suggests that industrial arts also helps prepare all individuals for meeting the requirements of a technological culture, to understand industry and fellow workers, to develop technical problem-solving skills related to materials and processes, and to develop skill in the use of machines and tools. He considers students with IQ's between 50 and 70, who are not particularly gifted with their hands and have a need for experiences which are meaningful and can lead to success, as being slow learners (probably more accurately identified as EMR).

The industrial arts teacher of retarded learners should have specific training for working with such children; he must be understanding and prepared to provide the necessary meaning and purpose already mentioned. Moeller suggests various activities for different ages and levels, e.g., activities to develop manual dexterity at the primary level and minor home repairs for junior high school students. Junior and senior high school students should be provided an overview of the world of work as well as ways to get a job and hold it, budgeting, and family and community relations.

Smith and Tisdall (1965) point up the problems created for teachers of industrial arts and vocational education with the increasing awareness and publicity in planning for and dealing with culturally deprived and handicapped children. Previous articles by these authors provoked many requests for specific ideas for the industrial arts teacher of the retarded (Tisdall, 1964; Smith, 1964). They suggest that the shop setting is the place where more can be done for the retarded student than any other educational environment. Non-verbal activities and manipulative tasks help the retarded learner develop and maintain a more effective level of motivation at which learning takes place. Concrete, rather than abstract, learning experiences which are profitable can insure success which the retarded child needs for confidence. Preparation for gainful employment which can take place in the shop must include learning social skills, performing activities of common interest, and teaching industrial-vocational skills.

The authors emphasize that the industrial education teacher can synthesize subjects for the retarded child which he cannot understand by himself, such as the role of arithmetic in job situations. Shop situations allow for problem-solving moreso than do other academic subjects. Cooperation between the industrial education teacher and the special class teacher should result in a program articulated for the benefit of the child, rather

than two separate programs which function only in their respective areas of interest. Lastly, the teacher must consistently remember that the EMR child will progress at one-half to three-fourths the rate of "average" students. Thus, the teacher should provide the retarded child with manual and academic learning experiences which will not allow him to procrastinate, but will promote personal-social growth toward his successful adulthood.

Physically Handicapped

This section will deal mainly with students handicapped by physical shortcomings and will include orthopedically handicapped, visually handicapped, deaf, and perceptually handicapped children.

Orthopedically Handicapped. Skill development for the physically handicapped can be incorporated into an existing structure by using the industrial arts shop. Siegel and Haug (1970) give recommendations for shop planning, layout, and equipment to carry out individual and group projects for school and community service. The criteria for evaluating such a shop program are: practicality, a goal of muscular development, fulfillment of present and future skill demands, safety, easy and safe access to tool storage and equipment, firm shop routines, display area for encouragement and motivation, continuous evaluation and reevaluation, and a time clock and rack for more mature groups.

The goals to be met are: developing muscular skills, allowing for creativity, creating an industrious and purposeful atmosphere, teaching cooperation, correlating industrial arts with academic activities, promoting success by providing useful projects, and preparing for future employment by teaching safety and other industrial practices. The facilities in the program described are most complete for teaching ceramics but good, basic facilities and equipment are also available for graphic arts publications, general industrial work, and woodworking.

Haug and Rifkin (1970) describe the success of an experimental industrial arts program at the junior high school level which serves the needs of the multiply-handicapped. The program is conducted in cooperation with the health conservation teacher and uses the criteria identified above for developing program activities.

Industrial arts majors in colleges may wish to examine the practices incorporated as part of manual arts therapy to assess their appropriateness for teaching industrial arts for orthopedically handicapped students as well as other children with special educational needs. Manual arts therapy applies the techniques of industrial arts and the psychological

principles of learning theory so that physically disabled patients (or students) can develop manual skill and self assurance (Best and Eagleson, 1968).

The manual arts therapy clinic is similar in set-up and content to a general or unit laboratory in a typical industrial arts program, but the objectives and the individuals involved are vastly different. All types of handicapped patients, even psychiatric, can be helped, particularly the severely disabled and chronic cases. Caution must be exercised in supervision, especially regarding tools used. A simulated work situation of an occupational or industrial nature commensurate with the individual's disabilities and capabilities can test, measure, and develop the work capability and emotional adjustment of the patient.

There is needed, however, more inter-professional communication and understanding because educational and medical people do not always understand manual arts therapy and the role that industrial arts has in this therapy. While manual arts therapy has some application in public schools for physically and emotionally handicapped learners, it is most commonly found in veterans administration hospitals (Henry, 1965).

Industrial arts can also be instrumental in providing both types of activities used in occupational therapy: diversional activities which induce rest, control exercise, and sustain morale; and functional activities which assist in the restoration of muscle function, improve the general condition of the patient, build physical endurance, and aid in mental rehabilitation (Betando, 1963).

Mental patients could benefit from the therapeutic value of industrial arts activities because they provide: (1) an outlet for their aggressions, (2) encouragement of advantageous identification, (3) atonement of guilt, (4) a means of obtaining love, (5) a means for acting out of fantasies, and (6) opportunity for creative work. The physically disabled patient needs to improve the motions of joints and strength of muscles to develop coordination, motor skills, and work tolerance; and to prevent the building up of unwholesome psychological reactions or correct them if they are already established. Industrial arts activities, such as use of the handsaw, could help a patient with nerve injury improve his motor coordination (Betando, 1963).

The need for vocational guidance and counseling is [illegible]ative, especially in cases where a patient's work and life styles are drastically changed by injury or illness, e.g., a door-to-door salesman who has incurred a spinal injury might be advised to enroll in a drafting course after a counselor determines his graphical language aptitude. An industrial arts teacher with some special training in psychology and clinical field experience in a medical setting could assist the physician

and psychologist in these diagnoses. Betando believes that the range of industrial arts activities that may be used in rehabilitation are as broad as the needs and interests of the disabled persons being treated. These activities can help develop self-confidence and poise, alleviate tension, and add to the satisfaction of living.

The Crippled Children's School (North Dakota), considered the following 10 points when establishing their industrial arts curriculum:

1) The mental ability of the students is within the normal range.

2) The students range from fourth grade through senior high school.

3) They are physically handicapped and attend class in wheel chairs and on crutches.

4) Those with severe handicaps must be evaluated as to the extent of their physical abilities.

5) A number of them require college preparatory skills.

6) There is a need for a pre-vocational program for those who will go directly to a job from high school.

7) Those who will not be able to work or go on to college must receive other assistance.

8) Those with superior mental ability need an individual accelerated program.

9) A number of students who border on the average intelligence also need a specialized program.

10) Students in this school are so physically handicapped they are unable to attend public school (Echelbarger, 1960).

Simplified instruction in industrial arts begins at the Crippled Children's School in the fourth grade, when students are encouraged to become more inquisitive about their environment and self. To help accomplish this goal, students first study ceramics and construct other simple projects in different media. The program at the junior high level is designed to provide information regarding industry and workers, to develop hobby interests, to afford practices in the safe handling of tools

and equipment, to give opportunity for cooperative group effort, to illustrate and vitalize academic subjects, and to allow students to become familiar with the basic tools and machines. Students with steady hands are placed in the regular industrial arts curriculum; palsied children or children otherwise unable to use their hands well are evaluated to determine their abilities and are given appropriate projects and activities.

The high school curriculum of the school prepares students for college, work, or home activities. Machinery and equipment have been adapted to fit the stature of those in wheel chairs and on crutches; and the students design and make aids to assist them in the use of tools. Class size is kept small and, because of much individual attention, the physically handicapped students seem to have more initiative and interest in taking advantage of the programs they are offered (Echelbarger, 1960).

Visually Handicapped. To collect information regarding instructional practices and teacher preparation for the visually handicapped, Baugrud (1968) used two self-report instruments completed by industrial education teachers employed in residential schools for the blind, and a group of specialists in blind education. The findings point to an adequate professional preparation of industrial arts teachers for the visually handicapped. Industrial education teachers in residential schools were interested in growing professionally but did not show interest in being rated by the American Association of Instructors for the Blind (now known as the American Educators of the Visually Handicapped). Full agreement on proper instructional practices for the blind was evident between industrial education teachers and the blind education specialists.

The Rehabilitation Teachers of the Blind Program at Western Michigan University began, in 1963, to train blind and partially sighted graduate students to become rehabilitation teachers for the newly blind and those losing their sight (Bruce, 1968). The industrial education department services the curriculum through a course, "Home Mechanics for the Blind," designed to instruct these students in minor household repairs and, more important, provide opportunities for them to develop personal confidence and independence.

Several conclusions were drawn: (1) much individual and personal instruction is needed; (2) an extremely low teacher-student ratio is necessary; (3) each student should have his own set of tools so he can feel them as the teacher instructs; (4) orientation to the laboratory situation takes longer because the blind person must be very familiar with the entire shop layout--guide dogs are helpful in this; (5) measuring proved extremely difficult, even with Braille rulers; and (6) grading visually handicapped students was not as easy for the instructors as

grading the sighted. Finally, activities such as hammering, sanding, and drilling were not as difficult challenges as finishing, which is arduous for the visually handicapped. Sawing was accomplished much more easily if a miter box was used (Bruce, 1968).

Anthony (1970) has developed and validated instructional aids and devices for blind woodworking students which might be useful in solving some of the problems cited above. Measuring blocks were made to facilitate measuring. Other aids devised were miter gauge extensions, extension clamps, saddles and push sticks for circular saw aids, and several aids for the drill press and band saw. These innovations made safe the operation of certain woodworking machines for blind students. Visually handicapped students at the Governor Moorhead School for the Blind (North Carolina) evaluated the program, approved of it, and made further recommendations for valid and effective devices to aid the blind industrial arts student.

Industrial arts programs specifically geared to occupational training are not perceived as having much benefit to blind clients of Iowa Commission for the Blind (Black, 1970). The blind clients, businesses, and industries in Iowa were questioned to investigate hiring policies. Blindness is apparently a bigger deterrent to employment than the blind person's education or training. Blind clients revealed that they are not aware of the real purposes of the industrial arts program at the school. Over 70 percent of the employers questioned said that they would not welcome blind employees, even though they previously stated that there would be more blind persons working in industry if they were given the opportunity to demonstrate their abilities as an employee. Apparently, there is little effective communication between business and industry, the Iowa Commission for the Blind, and their blind student-clients.

An industrial arts workshop for teachers of the blind in residential as well as regular public schools was held at the State University of New York at Oswego in 1966. The program was funded by the Health, Education, and Welfare Vocational Rehabilitation Administration. One of the main purposes of the workshop was to acquaint teachers with the latest instructional resources and teaching aids for the blind.

Maki (1965) reports on a workshop of this type and describes devices introduced there which are useful for teaching the blind. He also describes special tools designed for teaching industrial arts to blind students.

General rules which may be adapted to individual laboratories, sample lesson plans, and recommendations for the industrial arts teacher of the blind are provided in an illustrated article by Walter (1967). In addition

to the recommended instructional techniques, he suggests that the assignment of a teacher with strong patience and interest be at the top of the list.

Additional information regarding instructional practices for physically handicapped children has been generated by experienced industrial arts teachers as part of their graduate study. For example, Babik (1967) and Meekma (1966) first identified the educational characteristics of the blind and multiply handicapped learners. They then developed outlines of suggested courses of study in woodworking including representative projects, tests, and teaching aids.

Deaf. Hearing problems are another form of handicap to be considered in industrial arts curriculum planning. The literature, however, is almost void of discussion on this topic. Nace (1968) states that few deaf students are able to go on to college, so about 90 percent of the students who enroll at the Pennsylvania School for the Deaf are trained for industry. Elementary and Secondary Education Act (Title I) funds are used to buy more laboratory equipment, especially in the area of graphic arts, because printers are always in demand. Nace, headmaster of the school, believes that industrial arts instruction usually only gives "sample" technical skills. Therefore, he recommends that vocational teachers be employed to use actual equipment and machinery found in industry as the answer to the problem of training deaf students for jobs. Nace lists teacher requirements and identifies course offerings for specific ages and sexes in the area of vocational education.

Perceptually Handicapped. A perceptual handicap is another type of physiological or neurological disability that the industrial arts teacher copes with; however, he is often unaware of the nature or origin of the handicap. A child with a perceptual handicap has trouble forming refined and organized perceptions. He is easily discouraged because he has trouble mastering school skills (Ferinden and Kruck, 1970).

Although industrial arts is most often taught to students over age 12, younger children could benefit from instructional programs using nonverbal techniques and practices in the most concrete and action-oriented context possible and involving multi-sensory techniques. Industrial arts offers this type of learning environment plus a means for the student to satisfy his needs to know himself and the world about him, as well as an opportunity to assemble ideas, knowledge, and techniques.

The teacher of the perceptually handicapped must be relaxed, calm, and objective, working at a slow pace so the student does not feel hurried. Classes need to be short but held daily; progress should be recorded. It is recommended that the industrial arts teacher consult with the school psychologist in order to relate instruction to particular handicaps.

Other Exceptional Children

The term "exceptional children" is all-encompassing; it includes slow, retarded, physically handicapped, emotionally disturbed, delinquent prone, and gifted learners. Some educators use it in offering suggestions for coping with students of different ability levels or meeting individual needs. Several contributions will be reviewed in this section that could not be appropriately included with the previous discussion of exceptional learners.

Willoughby (1960) reports on Eastern Michigan University's efforts over the past 30 years to cooperate with the school's department of special education in establishing general industrial arts courses to prepare teachers in adjusting their thinking and planning to provide for exceptional students. According to Willoughby, the following five points should be remembered in developing such teacher preparation programs.

1) Prospective teachers must recognize individual differences.

2) They must develop the ability to analyze subject areas and techniques in industrial arts and crafts as to their potentialities for all types of students.

3) They must learn to adjust the content and method of these areas for different abilities.

4) They must be provided as many general industrial arts experiences as possible.

5) Courses must have objectives stated in terms of individual growth and industrial information.

These suggestions are followed by descriptions of the courses offered in 1960 to prospective teachers at Eastern Michigan--namely, woodworking, general metalwork, art metal and plastics, general crafts, printing and graphic arts, general drawing and planning, and introduction to industrial arts. In the last course named, introduction to industrial arts, a study of the exceptional student is made in relation to how industrial arts instruction can serve the needs of these learners.

An emotionally disturbed child need not be retarded although he often achieves on a level lower than his chronological age. His emotional instability may arise from any of a number of factors--a broken home, a mentally ill parent, failure to succeed, or it may be the result of a physical-organic condition. His maladjustment can be manifested by sullenness, aggressiveness, truancy, or apathy; sudden fits of anger, temper

tantrums, and illegal acts are all means of manifesting anxiety. The teacher of the emotionally disturbed must be well-integrated, emotionally stable, sensitive, secure, and must love children. He should be ready to fill the "parental role," while being cognizant of peer and environmental influences. The industrial arts teacher must be able to absorb the student's frustration and failure in the laboratory and be introspective and insightful regarding subsequent student performance.

Foster (1964) believes that the good teacher is a social worker, guidance counselor, and psychologist all in one. The curriculum must be functional, relative, and practical. Teaching methods must include the setting of reasonable limits, extensive repetition of shop rules and safety practices, and definite standards with easily attainable objectives to reduce anxiety, confusion, and frustration. Provision for a nonwork area is advisable in teaching disturbed students, since they should not be forced to work. A laboratory library with popular industrial-science magazines or self-study films would be beneficial as a deviation from laboratory activities.

Some suggestions for motivating emotionally disturbed children to become interested in other areas are to:

1) Assign written work that requires library reference work;

2) Inform the language arts teacher so he can assist;

3) Explain scientific or mathematical concepts that relate to the operation of machinery and laboratory practices; and

4) Integrate social studies with industrial arts activities by reproducing historical scenes in linoleum or woodcuts or by building replicas of old industrial products (Foster, 1964).

Cohen (1963) reports that the Hawthorne school for special children had a problem with a group of teenage boys who functioned three to six years below a normal achievement level until a modified form of an academic program within an industrial arts setting was established. Other academic subjects were integrated as much as possible within the industrial arts area. In addition to tools and materials used in the shops, displays, field trips, films, and filmstrips helped correlate the social studies curriculum with the shop classes. Mathematics was integrated even more easily by using the ruler and caliper to perform measurement activities, geometric shapes in the design of projects, and practical application of everyday mathematics in conducting laboratory practices. Science also came naturally, especially in the study of electricity; space activities,

Morse code, and weather all contributed to this integration. Language arts also were exercised; letter writing (e.g., to labor associations and industrial concerns), reading articles on industry and industrial products, completing laboratory worksheets, and preparing oral and written reports on field trips all provided English exercises normally resisted by students. Job information was presented by films, guest speakers, field trips, printed materials, and lectures. According to Cohen, the experiment proved successful in improving achievement, personality, and social intercourse.

Filbin (1971) believes that educationally handicapped persons--children, adolescents, and adults with learning behavior problems--have not received enough consideration by providing the flexible programming they need. These persons are given labels such as autistic, delinquent, and incorrigible; they are ridiculed, failed, and socially isolated. Active programs in industrial education can provide opportunities for the total sensory involvement of the handicapped including an exposure to color, texture, odor, and sound; and exploration and guidance with respect to tools, materials, and processes. This eight percent of the educational population needs programs designed to bridge the gap between the learner with behavioral problems and meaningful educational experiences.

The Learning and Behavior Problems Project at the California State College at Los Angeles consists of a special course sequence combined with enrichment activities to help educationally handicapped students in elementary and secondary schools work through a task to completion while progressing systematically (Filbin, 1971). After diagnostic procedures are completed and counseling and guidance are provided, an integrated curriculum is then planned involving introduction to labor development and manpower needs through industrial visitations, plus guest lecturers from business and industry, as well as a structured program of dualistic instructional responsibility. Class size, organization, atmosphere, and rapport are critical factors to be considered. Permissiveness rather than punishment is advocated; positive reinforcement, encouragement of further study, and oral communication contribute to a relaxed atmosphere which benefits the handicapped learner. The Project is aided by the Industrial Arts Association at the college whose members volunteer to provide classroom or laboratory experience in industrial arts education.

Industrial arts can provide for the development of a wide range of abilities, interests, and talents for students of all ability levels (Erickson and Suess, 1968). This potential contribution of industrial arts curricula should be made clear so that the shortage of industrial arts teachers might be remedied. Many students who have considered becoming industrial arts teachers are concerned about this area being a "dumping ground." Unfortunately, this is sometimes the case, especially in programs which have no challenge and are only a "holding area" for those who are unwilling or unable to learn.

Some school systems promote the above idea by labeling industrial arts courses with titles that may confuse or deter students from enrolling in them. In the St. Louis parochial schools, for example, courses geared to students of lower mental ability are entitled "drafting"; whereas the designation of "mechanical drawing" is reserved for courses designed for students of average and higher abilities (Eligius, 1968). Some teachers have recognized this problem and are trying to bring about changes in terminology to avoid the "labeling" of students and course offerings.

One program designed to meet all ability levels of students at one time is a drafting course designed by Calder (1971). Different problem sheets are used for each group--slow, average, and bright--which best utilize the students' comprehension. Standard procedures for using equipment are followed; the program is based on the unit method. Slower students begin with "Planning Sheets" while the average and gifted use an "Activity-Planned-Record." These and examples of each group's problem sheets are illustrated in the article.

Psychological implications of industrial arts are discussed by Ferinden and Kruck (1969). They believe that industrial arts can be more beneficial to students at lower grade levels than junior high in meeting the needs of the potential dropout, culturally deprived, and socially maladjusted student. Industrial arts can provide a new "gestalt" of group experiences, prevent boredom and self-defeating behavior peculiar to the dropout prone. It also provides a high degree of social interaction, competition and cooperation, and adaptability to one's environment. The authors describe a program in New York where students spend the morning in shop classes and the afternoons in academic subjects, in the belief that shop activities relieve frustrations, modify persistent failure patterns, and change attitudes of students with educational problems.

Suggested techniques for minimizing failure are: (1) open discussion; (2) providing for creative tasks which insure achievement and success; (3) minimal interaction and activity on the part of the teacher to foster student potential; (4) integrated curriculum; (5) individualized grading; (6) minimizing abstract approaches, emphasizing concrete experiences; and (7) class projects to enhance group identification, motivation, and self-esteem (Ferinden and Kruck, 1969).

Tomlinson (1965) states that the development of appropriate programs for exceptional students by industrial education personnel is necessary and desirable. Students derive benefits such as the development of understandings and attitudes which may enable them to make better industrial choices. Furthermore, the industrial education profession has an obligation by virtue of its objectives to interpret the industrial society; the

industrial education teacher should be proficient in relating content and principles of industry to those who will not attend post-secondary schools or programs.

Some of the merits of industrial arts and special education can be found in a description of the Lewis and Clark School (Bronx, New York) for socially and emotionally disturbed boys in grades five through nine (Haug, 1968). The school offers a "complete educational package" especially designed for emotionally disturbed students. Instruction in the industrial arts laboratory has been found to dramatically help disturbed children adjust to a school environment. Education for school, social, and emotional adjustments at Lewis and Clark has evolved from years of experimentation with various types of industrial arts programs. Instruction in the industrial arts laboratories represents a realistic philosophy of education and instructional strategy which appears to be appropriate for teaching disturbed children.

It should also be mentioned that the students with whom we work may be multiply-handicapped. For example, it is common for a mentally retarded child to also have a physical disability, whether it be a visual or hearing problem, dependence upon a wheel chair, or reliance upon a prosthetic device to function. A physically handicapped person may be both hard of hearing (or deaf) and unable to speak (he may talk with a speech impediment). A mentally superior child may have a perceptual or neurological impairment and, as a result, appear to be clumsy and awkward.

The industrial arts teacher should be alert to observe such multiple problems. Often such information may be obtained from the special education teacher or from the student's personal file, although the industrial arts teacher may be the first to discover some mild impairments (e.g., perceptual or neurological) while observing a student's motor performance activities in the laboratory.

The teacher must realize that the expected levels of attainment of such students will vary greatly, even if homogeneously grouped, because of wide variations in abilities, needs, and interests. The very bright child may be scientifically oriented and have more success in developing designs for models and apparatus than in the skillful construction of products with tools and machines. The retarded or emotionally disturbed child may find more satisfaction in using teacher prepared materials (prefabricated kits), plans, and templates to produce a product and may also lack the ability to excel as a craftsman. Often, however, with special assistance, some are capable of developing good technical skills, laboratory practices, and work habits.

The exceptional child may find industrial arts activities to be a great substitute for his inability to participate in competitive sports

or for his poor performance in other academic subjects. The information reviewed in this document suggests that industrial arts experiences can be educational and therapeutic for most handicapped school children. Cooperative professional activities with other educators in the school system should contribute to the development of an educational program which will meet these desired goals.

Disadvantaged and Culturally Deprived

These two terms--"disadvantaged" and "culturally deprived"--are used interchangeably or together in much of the literature in education. Generally, they both involve the following factors: biological deprivation; low IQ; lack of motivation; unfavorable attitudes toward self, others, and society in general; poverty; large families; resentment of authority; rejection of school; drug addiction; and delinquency. The child referred to as disadvantaged or deprived in the following pages may possess all or some of these factors. He may have withdrawal tendencies, achieve poorly in school, move frequently because of parent's employment or lack of employment, and be the product of a broken home or home where there is or was no "father" or male authority figure.

In general, many disadvantaged or culturally deprived children are also educationally handicapped as evidenced by retarded school achievement and deviant social behavior. Modified instructional practices and curriculum have been recommended to assure their continued educational growth and development. Each author usually gives his own interpretation or definition of disadvantaged or culturally deprived. These will not be repeated in each review unless such definitions differ drastically from the ones mentioned above.

Tuckman (1967) suggests a strong need for personal reinforcement of performance among this segment of students. Need for reward is great: warmth and sympathy from teachers may be the only way to get the student to know that such feelings exist. If possible, parents should be urged to get involved in the education of these youngsters. Graded tasks to enable success and progressive development and individual treatment can help in improving the educational development of deprived learners.

Educationally disadvantaged children might exhibit negative behavior which could disrupt the normal classroom activities. Suggestions for teachers of industrial arts faced with a "youth rebellion" are given by Decker (1971): be realistic, flexible, and firm; give opportunities for self-enhancement. Industrial arts curricula has the potential to provide educational activities for youth to get rid of aggressions, provide for self-esteem, and motivate youth who badly need it.

Examples of behavior exhibited by culturally deprived students may be found in countries like Malaysia and other locations serviced by the Peace Corps (Baxter, 1968). Many of these children have no mechanical skills or knowledge of tools and machines. Baxter suggests that industrial arts teachers can help achieve more desired results in international relations and development with Peace Corps service than can our foreign aid with material goods and money; however, too few industrial arts majors have joined the Peace Corps at the present time. The Peace Corps has tried to remedy this by establishing a crash program to retain liberal arts graduates who have enlisted in the Corps to teach industrial arts subjects and by expanding their recruiting campaign to attract qualified teachers of industrial arts.

Ghetto residents who are often economically deprived come into the industrial arts laboratory with one more strike against them than middle class students who may be deprived in some other way. These youngsters often have no experience with tools, have no money to purchase any, and in some instances do not have any encouragement in the home to pursue craft-type activities. Also, it is often suggested that a teacher of a different race may bring distrust into the picture; however, no empirical evidence is presented to substantiate this claim. Although few industrial arts texts incorporate ideas about teaching basic human values and instruction relating materials and processes to man, the industrial arts teacher should encourage competition within the students and should teach toward the goal of elevating the dignity of the student through the control of physical and social forces (Parker, 1968).

Gallington (1970a,b) has authored several papers on the subject of industrial arts for the disadvantaged and recently edited the 19th Yearbook of the American Council on Industrial Arts Teacher Education, entitled Industrial Arts for Disadvantaged Youth. Gallington recommends industrial arts instruction for elementary school pupils. He sees such instruction as reconstructing life activities at all societal levels so that students will be reached and perhaps prepared for life long before they drop out of school.

Disadvantaged youth often have several influencing factors beyond those affecting all youth, such as physical handicaps, mental handicaps, personal acts (e.g., disease, crime, and pregnancy), changing technology, and home and family changes. Gallington cautions against the industrial arts teacher diagnosing the problems of the deprived student; diagnosing should be left to the experts and the industrial arts teacher can assist with the treatment.

While Lockette's (1970b) contribution to the 19th Yearbook does not specifically mention industrial arts, it does provide a rather comprehensive review and synthesis of the problem and needs of socioeconomically

deprived children who are students in urban centers. A study of Lockette's scholarly discourse should provide the industrial arts teacher with a basic understanding of environmental and cultural factors and educational practices, such as testing and motivation techniques, which have an impact upon one's educational and personal development. Hopefully this information will help destroy some of the myths held by teachers regarding the potential of disadvantaged youth.

Lockette points out that there are gifted children among the disadvantaged, and industrial arts teachers should become aware of signs by which these gifted students may be identified. Teachers must realize that the unkempt, apathetic, and disinterested students of all races from all geographic areas may have the potential for greatness. Lockette provides information which could serve as a reference for the industrial arts educator who is planning, developing, and conducting relevant industrial arts instruction for disadvantaged students.

Heggen (1970:76) describes the industrial arts teacher's role in the education of disadvantaged students. An educational program is only as good as its teachers; their methods and techniques are most important. Heggen refers to the Panel on Educational Research and Development's report on the failure of urban and rural schools to teach disadvantaged students: (1) there is severe academic retardation which steadily grows worse as the disadvantaged youth get older; (2) the dropout rate is over 50 percent; (3) less than five percent pursue any form of higher education; and (4) a tremendous number leave school ill-prepared to participate in the community or lead a satisfying, useful life.

Heggen maintains that the disadvantaged child is often rightly classified as a slow learner, one whose learning style is inductive rather than deductive, is often nonverbal, and is unprepared to face society, particularly as a successful participant in business and industry. In looking at the Pestalozzi school, established in 1771 for poor and delinquent children, Heggen sees mirrored the most recent philosophies and techniques used to educate the disadvantaged. John Locke is also cited as an early advocate of education geared to pre-occupational activities.

The industrial arts teacher of the disadvantaged, according to Heggen, often has a middle class background and, therefore, needs to engage in special teacher education which will inform him of the psychology, aims, and aspirations of this group. He must deviate from the usual "project" to involve his students with life situations and industry to meet their needs on all levels of interest, aptitude, and capacity. Some new approaches to teaching industrial arts to the disadvantaged are recommended, e.g., career development and preparation, elementary industrial arts, team teaching, and integrated teaching (cooperation of

different subject matter fields). Recommendations for teacher preparation include early classroom experiences for college students (internships); an inclusion of special education, sociology, economics, and communications in the curriculum; special curricula for industrial arts teacher education; and experiences in sensitivity training and understanding.

Heggen also emphasizes the appropriateness of industrial arts for an elementary school disadvantaged youngster. He views the major objective to be keeping such a student in school until he has achieved enough practical skills to serve him should he decide to drop out. Heggen's (1970) recommendations to teachers are:

1) Encourage growth in achievement and improvement of aspirational patterns;

2) Work to reduce pupil anxiety; help pupils get psychological problems resolved;

3) Provide reinforcement and reward;

4) Do not undereducate; develop a relevant curriculum based on physical involvement;

5) Employ projects that are well planned; and

6) Emphasize both individual and group activity.

Although the University of Illinois Project (Campbell, 1968) was designed to prepare vocational-technical teachers, Heggen considers some of its unique methods applicable to the preparation of industrial arts teachers and instructional practices for disadvantaged students.

Ray (1970) discusses content and curriculum of industrial arts for the disadvantaged. He presents the Taba model of general curriculum development process which includes seven steps: (1) diagnosis of needs, (2) formulation of objectives, (3) selection of content, (4) organization of content, (5) selection of learning experiences, (6) organization of learning experiences, and (7) determination of what to evaluate and of the ways and means of doing it.

To focus on the source and nature of the content of industrial arts, Ray discusses the nature of the terms "industry" and "technology." Curriculum planners, according to Ray, are charged with understanding this content as well as the importance of laboratory activity. Industrial technology should focus upon the study of efficient actions within the

industrial setting. The management and production dimensions of industrial technology must be considered in planning content for industrial arts because they are found in all human activity. Knowing the needs and characteristics of the learning population is also essential in planning curriculum.

Ray states further that industry is the source of content for industrial arts, and industrial technology is the body of knowledge derived from industry. Disadvantaged pupils, as well as all other students, should benefit from learning the nature of the three basic "families" of industry--manufacturing, product servicing, and construction. Instructional materials and strategies must be designed, developed, and implemented to help fulfill this recommended goal for industrial arts education.

Hinely (1970) discusses the special interest family of service industries, the servicing of industrial products, and the changing nature of the service industries. He recommends a planned sequential program to teach servicing which could employ the "learn by doing" concept, thereby increasing retention rate. Industrial arts should also include industrial occupation information for the disadvantaged, handicapped, and all potential dropouts so that they are introduced to such information before they drop out of school, and preferably before the tenth grade. There is also a need to prepare students to face job elimination and employment changes in the future, but this is not to say that certain services should not be taught if the teacher suspects that some day they will no longer exist.

Hinely gives these criteria for determining which service courses will be offered: need, available finances, and the population and location of the disadvantaged groups. Sample course outlines and recommendations for facilities are also provided in his work.

An instructional unit dealing with the manufacturing industries can provide educational experiences to help disadvantaged students comprehend the nature of, and opportunities in, our technological society (Lindbeck, 1970). Lindbeck differentiates between custom and mass production, and defines automation. He considers material resources, capital resources, and human resources the essentials of industry. The elements of industry are identified as research and development, production tooling, production control, quality, personnel management, manufacturing, and marketing. Lindbeck presents a sample instructional unit in teaching manufacturing along with recommended laboratory facilities, references, films, and research topics in manufacturing that may be incorporated in an instructional program for disadvantaged students.

Householder (1970) suggests that disadvantaged youth can probably relate to the subject of construction quite easily because it provides for diverse occupational opportunities. He believes that the improvement of the quality of life led by disadvantaged students begins with improvement in housing, and that a study of construction in practice can help achieve both of these goals. With a note of caution to include all ability levels, Householder outlines a construction unit. The outline considers not only the semi-skilled and skilled worker, but also the professional aspects of the world of construction. Suggestions are given for implementation of the suggested course outline in terms of facilities, courses offered, teacher characteristics and abilities, and community support. Also, a number of sources of valuable resource materials is included in the bibliography to assist educators in the development of industrial arts courses for disadvantaged youth in the construction industries.

Gallington (1970b) offers schematic floor plans of industrial arts teaching facilities for the three "families" of industry: construction, manufacture, and product service. He also challenges teachers, not only of industrial arts but others as well, to seek training which will enable them to assume their duties confidently and without fear. The industrial arts teacher needs to be accepted by other teachers as part of a team relating industry to all segments of other curricular offerings. Teachers are cautioned not to underestimate the impact of their personal feelings, attitudes, and concern for their students as they go about their teaching duties. Dropout-prone students often terminate their formal education before completing grade 12 because they think their teachers do not like them. Gallington (1970) suggests a study of the information presented in this ACIATE yearbook, Industrial Arts for Disadvantaged Youth, as a starting point for achievement of industrial arts objectives geared to the disadvantaged.

Several studies exist regarding industrial arts instructional practices for the culturally disadvantaged. Bell (1966) has developed an outline of an industrial arts course to provide prevocational information and skills for disadvantaged learners. The emphasis is on the development of basic skills regarding the use of tools and materials and an improved interest in industrial-type work experiences.

Stahnke (1965) expressed a concern for culturally deprived children's record of poor achievement on written tests generally administered by industrial arts teachers. Therefore, he developed an oral test in woodworking and administered it to his junior high school students. The children in this study were approximately two to three years below average in reading ability. The results suggest that disadvantaged children with retarded reading skills do perform better and have more success when taking a tape-recorded oral test on woodworking information than on a conventional written test on the same subject.

The need for individualized progress charts and student personnel plans is proposed by Foster (1966). He suggests that these instructional techniques are necessary for teaching disadvantaged learners because they need immediate feedback regarding their performance. The progress chart can provide a means of communicating success, rewards, and personal recognition. A tool-shaped chart is illustrated. Foster also recommends that a congratulatory letter be sent to parents of students elected shop foreman, safety engineer and the like, to give students and parents additional recognition and hopefully improve students' interest in their schoolwork.

Thomas (1969) charges teachers of industrial arts with improving their attitudes toward the deprived and poor if they are to teach them successfully. This change for the better can be attained by modifying pre-service teacher preparation; by increasing in-service training, efforts given to research, demonstration and pilot projects; and by changing people--not materials. A discussion of these topics is included in Thomas' speech. Industrial arts teachers are also advised to read more extensively, including information regarding learning and behavior, and make use of facilities such as the ERIC Clearinghouse on the Disadvantaged, Teachers College, Columbia University.

Thomas' guidelines for teachers of the culturally disadvantaged are:

1) Get involved--and accept the student as he is without qualifications;

2) Start without prejudice; do not use his prior behavior pattern to predict the future;

3) Make educational experiences applicable, concrete, and immediate;

4) Do not be too perfect or expect perfection from the students;

5) Be prepared to have your patience tried, your standards lowered, and your dreams modified; and

6) Believe in what you are doing and do not give up.

Thomas' presentation was made at the national AIAA convention in 1969, at the same time that several of the following contributions regarding industrial arts and special education were made.

Kerr (1969) describes how he teaches safety in plastics and woodworking in the Watts area of Los Angeles. An emphasis must be placed

on improving the attitude and motivation of inner-city school students toward shop safety practices. Relevance is important: an inner-city student has difficulty relating to something that does not do anything for him personally. Practicing safety may make him feel vulnerable: he needs motivation often provided by incentives, fear, and positive attitudes. Kerr admonishes teacher educators to provide prospective teachers with sufficient skills and knowledge in order that they might teach successfully in any ethnic environment.

The needs of disadvantaged youth and their implications for industrial arts were the topic of Kagy's (1969) speech. Total school commitment is needed to help the disadvantaged: industrial arts alone is not sufficient. Rapid technological change has created sociological consequences such as a communication gap between the residents of the inner-city and suburban areas; the development of negative attitudes regarding achievement motivation of the disadvantaged to and from the rest of society; and the changing nature of work in society and the attitudes of people toward work. All of these factors make teaching the disadvantaged difficult.

Kagy suggests ways to combat such difficulties: (1) recruit teachers who believe that the disadvantaged can learn and be successful in school activities; (2) make curriculum flexible to insure student success; (3) allow for the communication gap by changing teaching methods; and (4) change attitudes of teachers and students by changing teaching methods and course content. Kagy believes that industrial arts content and methods are relevant in teaching the disadvantaged, one reason being the opportunity for immediate reward which appears to be an imperative need of the disadvantaged.

Schenck, et al. (1968) question whether the original purpose of Upward Bound, i.e., an Office of Economic Opportunity funded pre-collegiate program for disadvantaged school students preparing to enter a four year degree program, is the only path out of the poverty cycle. They suggest that industrial arts instruction, including laboratory experiences which represent practices found in the world of work, is one other way of salvaging the self-respect of economically disadvantaged youth. The Purdue University industrial arts program for Upward Bound students attempted to teach basic understandings within the areas of graphic arts, general metals, ceramics, and electronics, with practical instruction in action-oriented activities simulating the world of work. Laboratory work was followed by field trips to acquaint the students with actual industrial practices. In addition, students participated in a seminar type session to acquaint them with various occupational opportunities and pertinent educational offerings in technology available at Purdue.

The Purdue Upward Bound 1967 summer program attempted to be more encompassing and designed for all students, not just college bound. Schenck, et al. (1968) feel that disadvantaged students must be provided with opportunities to think about, investigate, and select from many educational and occupational alternatives. Despite shortcomings in current teacher education programs, the authors believe that industrial arts can help economically deprived youth improve their potential for future educational experiences.

Lockette (1970b) reported to participants at a national convention of the American Vocational Association on a six-week institute entitled, "An Institute for Preparing Vocational and Practical Arts to Teach Disadvantaged Youth." The participants in the institute studied the causes and characteristics of cultural deprivation; surveyed educational programs for deprived; and developed curriculum, instructional materials, and strategies for teaching the disadvantaged. Lockette suggested that the information participants gleaned from the institute would assist industrial arts teachers in providing disadvantaged youth with marketable skills to reduce cultural deprivation.

Those who are educationally, economically, and politically disenfranchised, according to Hill (1970), are disadvantaged. Sometimes, notes Hill, students are labeled disadvantaged when it is really the teacher who is "disadvantaged" because he lacks the knowledge or abilities to relate to this group of students. To remedy this, the teacher needs to develop a rapport with the disadvantaged, provide a meaningful learning environment, and develop their potential for technical skills and problem-solving abilities.

Industrial arts teachers have always had disadvantaged individuals among other students, but the number of them in schools has increased, contends Witherspoon (1971). He recommends a structured class with firm organization rather than a permissive atmosphere. Necessary elements for a program for the disadvantaged are: a curriculum based on their environment and real problems; opportunity for growth in academic skills; and opportunities to handle tools, materials, and equipment.

Several teachers of industrial arts for culturally disadvantaged youth presented their experiences to the membership of the 1969 American Vocational Association National Convention (Miller, et al., 1969). Each of the presentations provides a description of the community or students served, an analysis of instructional activities and goals, and identifies the unique contributions provided to culturally disadvantaged youth enrolled in these exemplary industrial arts programs.

Tillmann (Miller, et al., 1969) demonstrates how the Industrial Arts Curriculum Project (IACP) World of Construction course was used in a

Chicago elementary school, grades seven and eight. IACP construction is relevant to the needs of the disadvantaged because the instructional program (1) provides concrete materials, (2) involves personal experiences and maximum opportunity for participation, and (3) maintains classroom organization and structure. Learning experiences involve cognitive growth: basic concepts and skills; affective goals: self awareness, relating to society, and emotional expression; and career development: exploration, safe work attitudes, and assessment and development of occupational skill.

Miller (Miller, et al, 1969) describes a course entitled "Basic Mechanics," which was developed for inner-city junior high school students in Columbus, Ohio. "Basic Mechanics" is designed to provide non-verbal and potential dropouts with a variety of experiences which may prepare them for gainful employment. Instruction centers around small engine and appliance service, electricity, and home maintenance. Industrial arts instruction provides a practical application of communication skills, mathematics and science, occupational guidance, and wholesome work attitudes and habits. An emphasis is placed upon the exploratory and motivational aspects of industrial arts for disadvantaged learners.

The role of the IACP's World of Manufacturing program in a Trenton, New Jersey junior high school is discussed by Meirs (Miller, et al, 1969). Traditional industrial arts instruction in many urban schools was sufficient to meet the needs of learners a decade ago because of its emphasis on recreation and home workshop skills. Changing neighborhoods necessitated a modification of instructional activities to make industrial arts more relevant to disadvantaged junior high school learners, many who were reading on the average of four years below grade level, and the IACP program appears to provide the desired experiences. Reading disability can contribute to the lack of interest of students in some of the new industrial arts programs like IACP that require the reading of a textbook and laboratory manual. However, Meirs suggests that an experienced teacher can coordinate group instructional activities, thus placing less emphasis on the need for all students to read well for successful achievement.

To determine if industrial arts experience has been a means of encouragement for disadvantaged youth, Enzian (1967) conducted a survey of students and instructors of the Manpower Development Training Special Youth programs in Ohio. He found that:

1) Industrial arts experiences helped students in the use of tools and solving problems related to their occupational training courses.

2) These experiences helped them understand the world of work and the organization of American industry.

3) There appeared to be confusion on the part of students in knowing the difference between vocational, trade and industrial, and industrial arts education.

4) Industrial arts instructors surveyed in this sample were doing little to provide pre-vocational guidance with reference to occupational qualifications and vocational training opportunities.

Eleven research studies conducted since 1960 concerning the needs and problems of disadvantaged students and having implications for industrial education are reviewed by Cochran (1969). In addition, the research provides information about the demonstration programs developed to alleviate the crisis resulting from the plight of the disadvantaged, and also the role and potential influence of teachers of students with special needs. The studies reviewed were generally concerned with career development; occupational education; and related topics including drop-outs, environmental and economic deprivation, minority groups, urban youth, and delinquency.

Summer activity for disadvantaged youth was provided by the Los Angeles City Schools Industrial Education department in the form of the "Operation 1000 Program" (Hansen, 1971). The program, funded by the state of California, included twenty-five students from grades nine to 12 who studied plastics in a six and one-half week course. Summer school credit for the first four hours (classroom instruction) and a minimum wage for the second four hours (laboratory instruction) were earned by the students. The products were made for the business division of the Board of Education from materials supplied by the Board. Hansen describes the instructional procedures and production methods employed in the program which apparently was successful inmotivating disadvantaged learners to study industrial practices.

Industrial arts is one of the curricula for underprivileged children in New York City which was evaluated by a Board of Education task force (Long, 1966). This team of educators and content specialists examined the material within the framework of specially prepared guidelines and previously stated objectives for middle schools. These objectives were to develop the insights, understandings, and appreciations necessary for disadvantaged youth to live competently in a large city. The curriculum was also evaluated in relation to the ideas and practices of five selected, integrated New York City schools which serve disadvantaged children and successfully meet middle school objectives.

Comparisons were made with curriculum developments in Los Angeles, Chicago, and Philadelphia. Recommendations are included for improving the curriculum project and the implementation of the middle school concept. Appendixes include a study of the academic achievement of the pupils in the five integrated schools, the suggested guidelines for use by specialists in developing the new curricula, and the actual evaluations of the available task force reports.

Industrial arts was included in compensatory education activities and school services offered by the Wichita (Kansas) Unified School District (1967). In-service and pre-service training programs for school personnel were provided in industrial arts as well as programs for neglected and delinquent institutionalized children, cultural enrichment, and physical fitness. In this report, evaluation strategies, objectives, procedures, and results were reported.

The Buffalo (New York) Schools offered an afternoon remedial and enrichment program to inner-city low income children in grades three to eight (American Institute for Research in Behavioral Sciences, 1969). Remedial instruction was provided to classes of six or less in reading and mathematics, and enrichment teachers taught classes in industrial arts and other areas. About 75 percent of those involved in the enrichment program were black students, many of whom may have had a negative attitude toward industrial education.

Feirer (1969) suggests that because of the menial position that blacks often find available in industry, black leaders may feel that a stigma is attached to industrial education. Blacks need equal opportunity in order to have equal skills to qualify for places in industrial society, and industrial educators can be of assistance in helping them to achieve technical knowledge and skills. Since America's future lies in its teachers, young blacks as well as other minority students should be encouraged to enter teacher preparation in industrial education.

There is a need for in-service training to retrain urban teachers who cannot relate or are having difficulty relating to the disadvantaged youth they are teaching (Buffer, 1969b). Pre-service people may be aided by early classroom experience and advancing educational technology which offers such aids as simulation, microteaching, critical incident films, interaction analysis, and nonverbal communication.

Buffer recommends the modification of teacher education programs to include supervised clinical experiences with disadvantaged students for experienced and prospective industrial arts teachers. Such field experiences along with the development of skills in educational technology (e.g., formulating behavioral objectives, and employing interaction

analysis and behavior modification techniques) will help with the preparation of efficient and effective educational practitioners. The writer theorizes that teaching industrial arts in urban center schools would become more attractive if teachers were better prepared and had more success in modifying the educational and social achievement of inner-city students.

The "clinical team" approach is recommended as an alternative strategy to on-campus teacher training. The team would include a campus professor of industrial arts teacher education, a master teacher from a local school system who has been specially trained to perform this task, a learning specialist, and an educational diagnostician to assess educational achievement and assist with the prescription of educational treatment. This team would play an integral role in the planning and conducting of teacher education practicums where master teachers would learn to function as a member of the "clinical team," develop basic insights and skills in educational technology, learn how to conduct in-service education for other teachers, and develop techniques of implementing educational change. Master teachers need to learn and practice the techniques necessary to diagnose, prescribe, assess, and feed back both student and teacher behavior. Actual practice in this role as a teacher-clinician-supervisor should be provided through simulation and intensive field experiences. This kind of educational preparation would provide experienced industrial arts teachers and supervisors with the necessary techniques and skills to assume leadership roles in the management of innovative practices in industrial arts.

Teachers in training for urban positions may gain valuable information and teaching skills by serving as teacher aides, interns, teacher associates, teaching assistants, and paraprofessionals in industrial arts classes periodically throughout their undergraduate program. Each position would serve a valuable and unique function in the professional preparation of teachers for urban schools.

A program involving "change agents" also would be useful in preparing teachers for disadvantaged students. Formal course work is one way to gain understanding of the disadvantaged, but a change agent would also participate in field activities in training and liaison work in the university and community, thus providing a bridge between theory and practice. Urban communities can be the teaching-learning laboratories. Teacher-coordinators, as adjunct field professors, will function as change agents as they teach disadvantaged students, train teachers, and assist with the development and evaluation of instructional materials and practices.

Baker (1969) maintains that industrial arts teachers have for years been doing what the National Education Association describes as essential

factors in teaching the disadvantaged in the late 1960's--namely, establishing classroom routine; defining standards of conduct within students' capabilities; being sensitive to individual needs and giving individual attention where needed; and offering a chance for success and recognition.

"Problem" students have been sent to shop classes for years because administrators were unable to find appropriate spots for them in the general education schema. The methods described above often help improve their attitudes, behavior, and performance, and allow them to become productive achievers. Baker suggests that other subject areas are just now beginning to follow methods and techniques used in industrial arts for decades.

The Dropout

One of the most common characteristics of the disadvantaged student is that he is dropout prone. The literature reviewed in the previous section often mentions the dropout when speaking of the disadvantaged. Several publications and articles, however, are concerned specifically with the dropout, and these are now reviewed.

The term "dropout" generally refers to a person who willingly terminates his formal studies in an elementary or secondary school before successful completion of a senior high school program and the earning of a high school diploma. This is not to suggest that potential dropouts are handicapped by a retarded pace of learning; Gallington (1970) states that the level of intelligence of dropouts approximates that of a normal distribution.

An interview with a deputy assistant secretary of the U. S. Department of Labor, who has a deep interest in the relationship of school dropouts to the current American manpower situation, suggests critical areas where the industrial educators can contribute to the solution of a problem (Wolfbein, 1962). The main recommendations are: (1) establish a developmental approach to guidance and counseling in this country, (2) encourage greater participation by various community agencies to make curricula up-to-date and relevant, and (3) establish meaningful programs of training at the secondary school level for non-college bound students. Wolfbein considers skilled crafts and service industries as the two best job opportunities for potential dropouts. He also recommends that these youngsters stay in school because a high school diploma is still excellent job preparation. Training programs for technically oriented fields can help the schools provide effective training as part of the regular curriculum.

As was the case with the literature concerning the disadvantaged, several experimental programs and studies have been conducted in an effort to ease the problem of dropouts and potential dropouts. Brennan (1963) presents several proposals for alleviating the dropout problem in West Virginia. Students leave school because of failure and retardation in school, dislike of school, home circumstances, marriage, conflicts with teachers, the need to work, and several other varied reasons. Vocational education is not perceived as the answer in West Virginia because of the numerous small schools which cannot support broad vocational programs. None of the conventional academic subjects show evidence of having holding power; however, industrial arts can be structured to do so. Proposals made to achieve this were: (1) a broad general shop program in the junior high schools, (2) general shops in high schools adequate for the needs of all who wish to enroll, (3) unit shops to expand technical exploration, (4) adequate state funds, and (5) appointment of a state supervisor of industrial arts to oversee the execution of the proposals.

Trapp (1967) believes that industrial arts, along with remedial courses in English, mathematics, and social studies, can give the student self-confidence and enough motivation to stay in school. Some factors contributing to the dropping out are boredom, discipline, desire for a car, and desire for independence. Trapps' recommendations for better serving the needs of potential dropouts include: (1) a general shop program taught by a "combination counselor and craftsman," (2) the teaching of remedial academic subjects possibly correlated with industrial activities, and (3) using texts and class sessions where students can learn technical information as a part of their academic study.

What some consider a "last chance" for high school potential dropouts is the advanced general shop at Omaha (Nebraska) Technical High School (Hepfinger, 1964). Two hours a day are spent in the shop accompanied by two or three required academic subjects, usually remedial in nature. Several kinds of industrial work are offered in the advanced general shop where enrollment is limited to 18 and the instructor has training in guidance as well as industrial arts. The student is allowed to select the type of activity he wants. Exercises in academic subjects are introduced as they relate to technical processes necessary in the shop and prove to be beneficial in teaching students. Strict discipline is maintained and each student is expected to keep up with production activities.

Hepfinger discusses the impact of industrial arts instruction upon the retention of secondary school students. He reports a case study of one student enrolled in a technical high school who attributed the combined role of industrial arts and guidance activities as the central force which kept him from dropping out of school.

Gadbois (1968) studied the relative holding power of the industrial arts curriculum as compared to the academic and vocational curricula of the high schools of Colorado Springs, Colorado. The most significant finding of the study is that the vocational and industrial arts curricula has significantly greater holding power than the academic subjects, particularly for those who have measurably high potential to become dropouts. No distinction is made in terms of the relative merits of vocational education versus industrial arts because it was found that there was relatively small measured differences in effectiveness between the two areas.

Ralstrom (1969) surveyed industrial education teachers to identify, evaluate, and study their beliefs concerning teaching practices for preventing dropouts. The objectives of this study were to: (1) propose and identify teaching practices that could prevent dropouts; (2) evaluate selected teaching practices that could prevent or contribute to dropouts; (3) discover whether teachers with school-team "holding power" differ in their beliefs concerning teaching practices that prevent or contribute to dropouts from the "usual" teachers in inner and outer city senior high and vocational schools; and (4) study, in depth, feasible ways and means of implementing or overcoming selected practices that could prevent or contribute to dropouts.

The major findings reported include 78 positive teaching practices, 18 negative teaching practices, and 12 teaching practices considered by inner-city teachers to be more critical in preventing dropouts. Twenty positive teaching practices are identified by inner-city teachers as having demonstrated school team holding power. Some techniques necessary for implementing these 20 practices are discussed and Ralstrom identifies factors which teachers suggest would make these practices difficult to implement in schools.

The above information suggests that industrial arts instruction can be of some assistance in reducing the number of youth who neglect to finish their formal education through the twelfth grade of senior high school. It is evident that the amount of research completed on this topic as well as several other topics regarding the education of students with special needs is minimal. Even though those who are contributing to the literature are enthusiastic about the relative values of industrial arts education for special needs students, additional formal research is needed to broaden our knowledge base. Empirical data are necessary to help improve the teaching-learning processes in industrial arts for all youth.

EPILOGUE

It is apparent that a small but increasing number of industrial arts educators have been concerned with problems relative to the education of the exceptional child during the past decade. A review of the literature in industrial arts education, including research that has been completed as part of doctoral and staff studies, identifies a void in "research" directly related to the topic, although essays and reports of teacher experiences are most common. The information provided should help industrial arts practitioners to function at the "awareness" level and serve as a frame of reference to adapt, adopt, or develop the necessary information, techniques, and strategies to effect educational change in the schools to meet the unique needs of children with learning disabilities.

Industrial arts has a rich heritage in providing educational experiences for children with special needs. Programs continue to be planned and conducted for youth who are mentally superior, mentally retarded, physically handicapped, culturally disadvantaged, emotionally disturbed, or potential dropouts. In many cases, it is the individual classroom teacher who finds it necessary to assume the leadership for adapting the curriculum to meet the unique needs and interests of children with special needs. Also, most of these curricular practices occur without the benefit of commercially produced instructional materials designed for exceptional students which, for the most part, are not currently available. Two notable exceptions include a craft text that was written especially for retarded students (McNeice and Benson, 1964), and a book devoted to elementary school industrial arts which includes a chapter dealing with industrial arts instruction in nontypical programs: namely the culturally disadvantaged; the slow, retarded, and above-average learners; and children with sight and hearing handicaps (Gerbracht and Babcock, 1969). Also, recently developed instructional materials, such as the American Industry and the Industrial Arts Curriculum Project (IACP) programs, have been demonstrated to be effective with students from varying socioeconomic and educational ability levels, and are now available to members of the profession.

Completing this review of industrial arts literature prepared and disseminated during the past decade provides the writer with a few interesting insights regarding the various classifications of "exceptional" children. For example, very little has appeared in our literature regarding industrial arts for physically handicapped, mentally superior, or emotionally disturbed students as compared with the number of manuscripts devoted to the retarded and disadvantaged. This occurrence may be related to the fact that most students enrolled in industrial arts are from the lower 75 percent ability levels and industrial arts educators

are seeking ways of better serving the needs and interests of these groups. Also, it must be recognized that a national effort has been undertaken by educators to ameliorate economic and social ills of society by providing compensatory education for "disadvantaged" learners.

In general, industrial arts teachers, supervisors, and professors have neglected "research and development" activities related to all types of exceptional children, but especially the gifted. One would expect that the emphasis on identifying the gifted child and channeling him into college preparatory courses for careers in science and technology since the reaction to the Sputnik scare in 1957 would also have signaled the need for identifying capable young men and women as potential industrial arts teachers. Apparently, this did not occur.

The increasing interest of industrial arts educators in the teaching of mentally retarded students is encouraging, especially since there has been some resistance to accepting retarded students because of the fear of industrial arts becoming a "dumping ground." It is apparent that industrial arts instruction provides unique educational benefits for retarded children in addition to occupational information and technical skill development, and educators are becoming more supportive of such programs.

A large portion of the articles written about the retarded, disadvantaged, potential dropout, and physically handicapped tend to stress the pre-occupational and vocational benefits of industrial arts experiences for learners. While it is generally recognized that industrial arts education also provides recreational, consumer, cultural, technical, social, and liberal educational benefits for learners, educators continually develop programs which emphasize the vocational or pre-vocational values and neglect other significant contributions industrial arts can make to the total development of human resources. This practice tends to reinforce the limited perception that school administrators, parents, and students often have regarding the role and value of industrial arts as a subject in the senior high school; and probably accounts for the fact that this educational discipline is perceived as being "special" or "non-academic," and that classes in grades nine to 12 have been generally composed of students of poorer academic backgrounds.

If industrial arts educators really believe the thesis that industrial arts is of value for all students and that it can make significant unique contributions to the development of the learner, then instructional programs must be developed which attract all students, and convince parents and educators of the relevancy of industrial arts as an integral part of public education at all levels. The information reviewed in this publication should provide the referent from which industrial arts educators may begin to function to attain these goals.

RECOMMENDATIONS FOR FURTHER RESEARCH AND STUDY

A number of articles have appeared in the literature which suggest that industrial arts activities are appropriate for all students and that industrial arts educators have a responsibility to modify curriculum, instructional techniques, and educational practices to best meet learners' unique needs and interests. This indicates a need for industrial arts educators to assume the responsibility for initiating, conducting, and disseminating the results of research and developmental activities that would improve industrial arts education for exceptional children.

The following research and development topics have been identified as priority areas based on this review of recent literature in industrial arts education. To best serve students with special needs and capabilities, industrial arts educators must:

1) Reconceptualize the rationale for the study of industrial arts at all grade levels for students with special needs. At the present, industrial arts instruction for exceptional children appears to be more like that provided for "normal" students although variations do exist in some cases.

   Industrial arts instruction is found primarily in grades seven through 12 although efforts are being made to provide industrial arts in the elementary grades. Structuring the body of knowledge which industrial arts represents and identifying curricular components for grades kindergarten through 12 would be the initial steps to help insure relevant educational experiences appropriately sequenced throughout students' schooling. Once the curriculum is formalized, teachers will be in a better position to modify instructional practices and provide learning experiences which may be continually built upon--a spiraling continuum--as one progresses through his initial 12 years of formal education.

   Industrial arts educators should work cooperatively with psychologists and other educational specialists concerned with educating the exceptional child by assisting in the identification of unique contributions that industrial arts can make at various grade levels.

2) Restructure instructional objectives in behavioral terms. An adequately designed curriculum should include a description of the kinds of expected behavioral outcomes that instruction intends to foster, that is, how the child will be different after participating in the industrial arts learning experiences.

Behavioral instructional goals also provide the teacher with a criterion for evaluating student progress on an individual basis as well as providing a benchmark to describe performance to the students, parents, and educators.

A listing of educational objectives and an analysis of the student's level of attainment may be kept in the student's personnel folder as he progresses through school. This information may be utilized by other industrial arts teachers (as well as other educational personnel) to provide appropriate educational experiences which will be cumulative and developmental in nature to insure continued progress and growth.

3) Develop and evaluate instructional units and systems. In order to adequately implement the recommendations discussed in Items 1 and 2, industrial arts educators must accept the responsibility for developing complete instructional packages which may be readily adapted or adopted for use in local schools. The past decade has seen curricular development in most conventional school subjects, including industrial arts. These instructional packages often include software and hardware for the student's and teacher's use. Similar kinds of developmental activities should be undertaken to create materials specifically for learners with unique needs rather than to assume that the classroom teacher will have the time, ability, or desire to effectively modify more generic instructional materials.

4) Develop and evaluate appropriate instructional technology. Little or no evidence is available to support the notion that methodology and instructional practices employed by industrial arts educators for the exceptional child differ from that of the "normal" student. Unique needs, interests, and capabilities of the exceptional child must be considered along with an assessment of his individual developmental patterns and performances when selecting appropriate teaching practices. The teacher must cooperate with other educators and researchers in selecting, developing, and testing different methods. While teacher demonstrations and project-making by students appear to be adequate methods of teaching industrial arts in many instances, some consideration should also be given to other techniques, such as role playing, simulation, gaming, discovery learning and problem solving, and programmed instruction. These are just a few examples of educational practices which could promote improved learning and development for most learners.

5) Develop and evaluate appropriate instructional software and hardware. This should include instructional materials for the learner and the teacher which are developed using the information in Items 1 - 4 as a frame of reference. Whenever possible, developers should field test the instructional materials with students for whom they are designed to evaluate their appropriateness and efficacy. Feedback from these field trials should be used to revise and improve the materials and also enable the teacher to assess their appropriateness for the exceptional children studying in his laboratory.

6) Modify industrial arts teacher education. New teacher preparation programs should provide prospective teachers with the necessary technical skills, instructional techniques, resource information, and pedagogical experience to be successful with all types of students including those with learning disabilities. This might include the requirement that prospective teachers observe exceptional children studying in the individual arts laboratory and regular classrooms (or view these activities in motion pictures) as part of their early professional field experiences. These visual experiences should help to make the information they obtain from their formal classes in education and psychology more relevant.

It is also suggested that early field experiences become an integral part of undergraduate teacher education. Prospective teachers could function as teacher aides during their sophomore year of study. Such duties might include the maintenance of tools, preparation of supplies, assistance with attendance, and the preparation of instructional bulletin boards and displays.

As juniors, they could function as teacher assistants by preparing instructional materials and teaching aids, presenting demonstrations, and conducting remedial instruction to individuals or small groups.

As teacher interns during their final semester in college, they could accept the primary responsibility for the development and utilization of instruction materials, techniques, and strategies for teaching industrial arts classes although under the supervision of a master teacher.

Some field experience time should also be devoted to visiting with guidance counselors, administrators, school psychologists, and special education teachers to become familiar with the operation of the total school program.

Those prospective teachers who express a desire to work with exceptional children should be given the opportunity for supervised student teaching in that area as well as supervised teaching experience with "normal" students.

7) Change the performing role of the teacher. The role of the industrial arts teacher should be modified from that of a transmitter of information and skill to one who functions as an educational clinician assisting with the diagnosis, prescription, treatment, and assessment of student behavior in the industrial arts laboratory. Information relative to this topic may be found in the 20th Yearbook of the ACIATE (Buffer, 1971: 153-6).

The teacher must cooperate with other educational specialists to provide educational experiences which are appropriate for the individual to insure continued development. To best function in this role, the teacher should have an understanding of learning theory and instructional technology, as well as industrial arts subject matter. These skills will enable him to create and manage relevant and effective instructional systems and experiences for learners with unique needs.

8) Expand efforts in the development and evaluation of therapeutic and remedial contributions of industrial arts activities for exceptional children. Children with poor success patterns in school often find the nature of industrial arts (i.e., its organization, structure, content, and method) markedly different from their conventional school subjects. Many apparently experience a greater degree of success in industrial arts activities than in other subjects. It is assumed that success promotes future success, and results in an improvement of interest in school, motivation for learning, and subsequent school achievement.

Several authors have suggested that industrial arts instruction can help improve the self-concept of the learner and his motivation for achievement. Research is needed to substantiate the impact of industrial arts instruction upon achievement in the cognitive, affective, and psychomotor development of students with special needs.

9) Utilize empirical research and evaluation techniques in developing and assessing the efficacy of educational materials and practices. Many statements have been made in the literature about the educational contributions and values of

industrial arts instructional materials and methodology for exceptional children without the support of data other than teachers' opinions. Research should be conducted to provide information and data capable of being verified by controlled observation, collection techniques, and experimentation.

The effectiveness of recently developed evaluation models to adequately assess the appropriateness, effectiveness, and validity of industrial arts instructional systems has recently been demonstrated (Buffer, et al, 1972; Maley, 1969; Miller, 1971; and Wenig, 1970). Curriculum developers are encouraged to formulate and utilize evaluation systems throughout the ongoing process of research and development.

It is also suggested that researchers consider the use of quasi-experimental designs and place a greater emphasis on action oriented research in industrial arts laboratories to assess the effectiveness of treatment modalities for learners with educational disabilities. A few references which may be readily used by industrial arts teachers include Barnes (1964), Campbell (1969), and Porter (1964).

10) Provide in-service education for experienced teachers. Develop instructional materials and conduct in-service education workshops for elementary and secondary school teachers, as well as teacher educators, to enable them to work more efficiently and effectively with exceptional students. Local, state, and national professional associations and governmental agencies may wish to cooperate with teacher educators and supervisors to create and implement strategies to attain this goal.

Teacher educators, administrators, and supervisors must assume the responsibility for undertaking research and development activities as outlined above. The industrial arts teacher often does not have the time or capability to undertake extensive research and development activities. However, teachers can continue to improve educational practice by conducting or cooperating with classroom research and field testing of instructional materials. School administrators should be willing to provide some resources (human and financial) and release time to encourage this kind of activity by the professional staff in their school system.

In addition, industrial arts educators can improve their understanding of the exceptional child and develop new information as a result of their formal graduate courses, self study, and staff research. Industrial arts educators also could benefit by seeking membership in educational associations outside of the field of industrial arts which specialize in educating the exceptional child.

It is a sound judgment that the problem of "justifying" the existence of industrial arts in public education will resolve itself when relevant instructional systems are installed and demonstrated in schools. A well prepared industrial arts teacher-clinician can communicate and work effectively with other educational specialists in the schools to serve children with special needs and capabilities (which in reality could include all students). With the advantage of the previously mentioned instructional materials and a well designed and equipped learning laboratory, a sincere and highly motivated teacher can do much for improving the education of exceptional children.

It is recognized that industrial arts teacher educators, researchers, supervisors, and administrators at all levels of education must assume the leadership for initiating research and development activities to increase man's accumulated knowledge, and also design strategies and techniques to implement them for practitioners in industrial arts education. Professional associations and governmental agencies should provide human and financial resources to support these activities. Industrial arts teachers must also be actively involved with these tasks, especially as they relate to the development and assessment of instructional policies, materials, and classroom practices.

Industrial arts educators should seek financial assistance from federal and state resources to develop special instructional programs and conduct research activities for the handicapped (broadly defined) as a means of expanding and improving current educational practices in public schools. Financial resources are now available to provide "seed" money for research and development activities in industrial arts education for children with special needs. The Vocational Education Amendments of 1968, for example, provide funds for establishing skill training programs for the handicapped in elementary and secondary schools. Additional financial assistance may now be authorized under the Education Amendments Act of 1972, PL 92-318.

Also, industrial arts programs designed to improve the education of handicapped children may be funded under the Titles I, III, and IV sections of the Elementary and Secondary Education Act (ESEA). Title I funds may be used for the in-service training of industrial arts teachers of economically disadvantaged students, whereas Titles III and IV are limited for instructional programs for children with learning disabilities. Financial assistance may also be obtained for the training of industrial arts teachers under Title V of the Higher Education Act; however, no funds are appropriated for 1973 although authorization is approved until 1976. A school system or university may develop a proposal and apply for financial assistance through the state agency which has the responsibility for awarding federal monies.

Of equal importance to research and development activities is the need to evaluate and disseminate the results of one's activities as a means of sharing new information with the profession. Only through the continued and expanded cooperative efforts of professionals can industrial arts educators attempt to more efficiently and effectively develop our most precious natural resources--our children.

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